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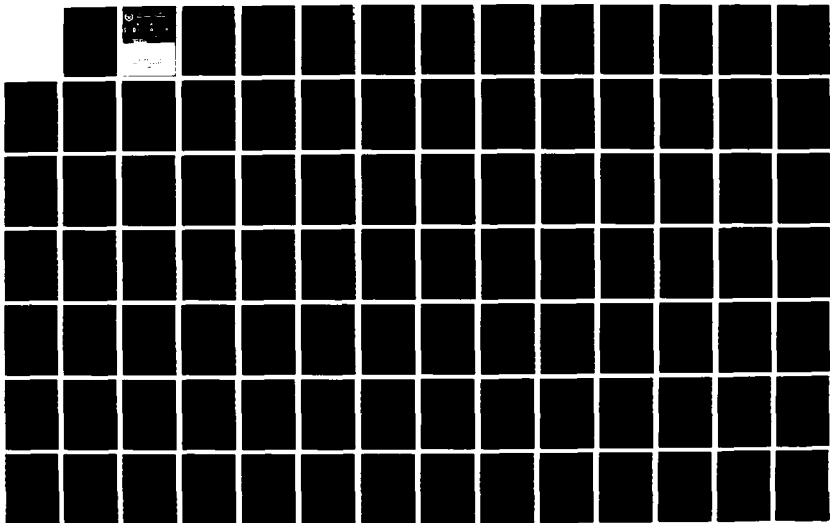
DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
(SBIR) ABSTRACTS OF PHASE I AWARDS <1986><U> DEPARTMENT  
OF DEFENSE WASHINGTON DC 1986

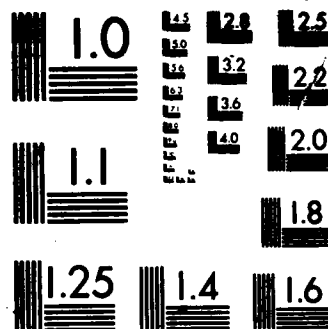
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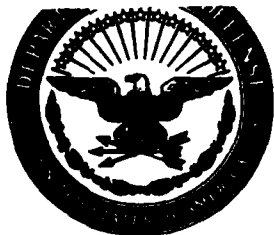




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DoD DEPARTMENTS/AGENCIES:



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Strategic Defense  
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## DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM (SBIR)



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# ABSTRACTS OF PHASE I AWARDS

April 1987

## PREFACE

On August 18, 1986 Secretary of Defense Caspar W. Weinberger announced the selection of small business firms whose proposals under Phase I of the Fiscal Year (FY) 1986 Department of Defense (DoD) Small Business Innovation Research (SBIR) Program will be funded upon successful completion of contract negotiations.

The selection of 1,018 proposals, from small business research and development (R&D) contractors, was made from 5,558 proposals received by the Military Departments, the Defense Advanced Research Projects Agency (DARPA), the Defense Nuclear Agency (DNA), and the Strategic Defense Initiative Organization (SDIO) in response to the FY 1986 solicitations distributed on October 1, 1985 with a closing date of January 9, 1986.

In order to make information available on the technical content of the Phase I projects supported by the Department of Defense SBIR Program, this report presents the abstracts of those proposals which have resulted in contract awards. Further, the name and address of the firm performing the work are given for those who may desire additional information about the project.

Venture capital and large industrial firms that may have an interest in the research described in the abstracts in this publication are encouraged to contact the SBIR firm whose name and address are shown.



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## INTRODUCTION

On July 22, 1982 the President signed the "Small Business Innovation Development Act of 1982" (Public Law 97-219). This law, effective October 1, 1982, is designed to give small high technology firms a greater share of Federal R&D contract awards.

The Act mandates that all Federal Agencies establish an SBIR program if their FY 1982 extramural budgets for R&D exceeded a threshold figure of \$100 million. (There are eleven government agencies meeting this requirement.) Beginning in FY 1983, DoD must make available the following percentages of its extramural R&D budget for this program:

	<u>FY 1983</u>	<u>FY 1984</u>	<u>FY 1985</u>	<u>FY 1986</u>	<u>FY 1987</u>	<u>FY 1988</u>
Percentage	0.1	0.3	0.5	1.0	1.25	1.25
Estimated Dollars	16.7M	43M	79M	150M	204M	262M
Actual Awarded Dollars	20.6M	44.6M	78.2M	150.7M		

### Objectives:

Objectives of the DoD SBIR Program include stimulating technological innovation in the private sector, strengthening the role of small business in meeting DoD research and development needs, fostering and encouraging participation by minority and disadvantaged persons in technological innovation, and increasing the commercial application of DoD-supported research or research and development results.

The SBIR Program consists of three distinct phases. Under Phase I, DoD Components make awards to small businesses, typically of one half to one man-year effort over a period generally not to exceed six months, subject to negotiation. Phase I is to determine, insofar as possible, the scientific or technical merit and feasibility of ideas or concepts submitted in response to SBIR topics. All DoD topics address specific R&D needs to improve our defense posture. Proposals selected for contract award are those which contain an approach or idea that holds promise to provide an answer to the specific problem addressed in the topic. The successful completion of Phase I is a prerequisite for further DoD support in Phase II.

Phase II awards will be made only to firms on the basis of results from the Phase I effort, and the scientific and technical merit of the Phase II proposal. In addition, proposals which identify a follow-on Phase III funding commitment from non-Federal sources will be given special consideration. Phase II awards will typically cover two to five man-years of effort over a period generally not to exceed 24 months, also subject to negotiation. The number of Phase II awards will depend upon the success rate of the Phase I effort and availability of funds. Phase II is the principal research or research and development effort, and will require a more comprehensive proposal which outlines the intended effort in detail.

Phase III is expected to involve private-sector investment and support for any necessary development that will bring an innovation to the marketplace. Also, under Phase III, DoD may award follow-on contracts not funded by the SBIR Program for products or processes meeting DoD mission needs.

#### Selection Criteria

Phase I proposals received in each topic area in the DoD solicitation brochure are evaluated on a competitive basis in the organization which generated the topic, by scientists and engineers knowledgeable in that area and in accordance with the following criteria:

1. The scientific/technical quality of the research proposal and its relevance to the topic description, with special emphasis on its innovation and originality.
2. Qualifications of the principal investigator, other key staff, and consultants, if any, and the adequacy of available or obtainable instrumentation and facilities.
3. Anticipated benefits of the research to the total DoD research and development effort.
4. Adequacy of the Phase I proposed effort to show progress toward demonstrating the feasibility of the concept.

Reviewers base their conclusions only on information contained in the proposal. Final funding decisions are made on the basis of the criteria stated above along with considerations of such factors as duplication with other ongoing work and the overall program balance.

FY 1983 Program

	<u>Number of Topics</u>	<u>Proposals Received</u>	<u>Phase I Awards</u>	<u>Phase II Awards</u>
Army	182	1121	98	45
Navy	131	944	66	45
Air Force	75	496	99	49
DARPA	8	128	12	8
DNA	10	88	8	2
	<u>406</u>	<u>2777</u>	<u>283</u>	<u>149</u>

FY 1984 Program

	<u>Number of Topics</u>	<u>Proposals Received</u>	<u>Phase I Awards</u>	<u>Phase II Awards</u>
Army	111	761	81	33
Navy	147	847	99	52
Air Force	283	1212	162	73
DARPA	17	107	15	7
DNA	8	80	12	0
	<u>566</u>	<u>3007</u>	<u>369</u>	<u>165</u>

FY 1985 Program

	<u>Number of Topics</u>	<u>Proposals Received</u>	<u>Phase I Awards</u>	<u>Phase II Awards</u>
Army	111	808	125	60
Navy	138	851	110	55
Air Force	218	1272	238	118
DARPA	17	130	14	8
DNA	7	95	18	2
SDIO	18	415	36	0
	<u>509</u>	<u>3571</u>	<u>541</u>	<u>243</u>

### FY 1986 Program

	<u>Number of Topics</u>	<u>Proposals Received</u>	<u>Phase I Awards</u>
Army	225	1642	244
Navy	190	1219	224
Air Force	304	1794	306
DARPA	22	177	44
DNA	7	171	46
SDIO	<u>12</u>	<u>552</u>	<u>154</u>
	760	5555	1018

### Summary

Presentation of the technical abstracts which describe the nature of the funded FY 1985 Phase I SBIR projects is the main purpose of this report. Proprietary information is not provided in these abstracts, therefore, technical details may be missing. For this reason, the report supplies the names of individuals in the small business firms who may be contacted should more information be needed on a specific project.

### Future Directions of SBIR Program

Public Law 99-443, the "Small Business Innovation Act of 1986" was signed by the President on October 6, 1986. This law reauthorized P.L. 97-219 to extend the "Sunset Clause" to

1993; to continue 1.25 percent taxation of the extramural research and development budget; and excludes from taxation those amounts of the DoD research and development budget obligated solely for operational systems development.



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
3C SYSTEMS INC 620 ARGYLE RD WYNNEWOOD, PA 19096 MURRAY KORNHAUSER TITLE: STUDY TO DEVELOP PREDICTIVE METHODS FOR ASSESSING MUNITION SENSITIVITY T 60 OFFICE: NAVSEA	NAVY	\$ 40,632

THE OBJECTIVES OF PHASE 1 ARE TO ACQUIRE AND ASSEMBLE DATA ON MUNITION SENSITIVITY TO DYNAMIC INPUTS, DEVELOP DISCRETE ELEMENT CODES FOR LOADING AND REACTION OF EXPLOSIVES AND MUNITIONS, EVALUATE THE PREDICTIVE UTILITY OF THESE CODES TO PREDICT REACTION THRESHOLDS OF MUNITIONS, AND TO PLAN THE PHASE 2 PROGRAM OF TESTING AND COMPUTER MODEL IMPROVEMENT. THE GENERAL APPROACH IN PHASE 1 IS TO EVALUATE THE EFFECTIVENESS OF DISCRETE ELEMENT CODES TO PREDICT MUNITION SENSITIVITY BY FIRST ASSEMBLING SENSITIVITY DATA FROM THE NAVY, ARMY AND AIR FORCE AND THEN EXERCISING THE EXISTING AND NEWLY DEVELOPED (IN PHASE 1) CODES AGAINST THESE DATA. THE RESULTS WILL BE AN EVALUATION OF THE STATE-OF-THE-ART OF PREDICTION EFFECTIVENESS, A COMPENDIUM OF EXPLOSIVE AND MUNITION SENSITIVITY DATA, AND A PHASE 2 PLAN TO PROCURE MORE DATA AND TO IMPROVE PREDICTIVE CODES.

3C SYSTEMS INC 620 ARGYLE RD WYNNEWOOD, PA 19096 MURRAY KORNHAUSER TITLE: STUDY TO DEVELOP PREDICTIVE METHODS FOR ASSESSING MUNITION SYMPATHETIC DETONATION T 59 OFFICE: NAVSEA	NAVY	\$ 50,204
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THE OBJECTIVES OF PHASE 1 ARE TO ACQUIRE AND ASSEMBLE DATA ON MUNITION SENSITIVITY TO SYMPATHETIC DETONATION, DEVELOP DISCRETE ELEMENT CODES FOR LOADING AND REACTION OF EXPLOSIVES, EVALUATE THE PREDICTIVE UTILITY OF THESE CODES TO PREDICT SYMPATHETIC DETONATION OF MUNITIONS, AND TO PLAN THE PHASE 2 PROGRAM OF TESTING AND COMPUTER MODEL IMPROVEMENT. THE GENERAL APPROACH TO PHASE 1 IS TO EVALUATE THE EFFECTIVENESS OF DISCRETE ELEMENT CODES TO PREDICT MUNITION SENSITIVITY BY FIRST ASSEMBLING SYMPATHETIC DETONATION DATA FROM THE NAVY, ARMY AND AIR FORCE AND THEN EXERCISING THE EXISTING AND NEWLY

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DEVELOPED (IN PHASE 1) CODES AGAINST THESE DATA. THE RESULTS WILL BE AN EVALUATION OF THE STATE-OF-THE-ART OF PREDICTION OF EFFECTIVENESS, A COMPENDIUM OF EXPLOSIVE AND MUNITION SENSITIVITY DATA, AND A PHASE 2 PLAN TO PROCURE MORE DATA AND IMPROVE PREDICTIVE CODES.

A/G TECHNOLOGY CORP 34 WEXFORD ST NEEDHAM, MA 02194 DR ARYE GOLLAN TITLE: ADVANCED PERMEABLE MEMBRANE OBIGGS/OBOGS SYSTEM T 94 OFFICE: ASD/XR	AF	\$ 49,931
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THE OVERALL OBJECTIVE OF THE PHASE I PROGRAM IS TO DEMONSTRATE THE FEASIBILITY OF NEWLY DEVELOPED ADVANCED PERMEABLE MEMBRANES FOR THE COMBINED DUTIES ON MILITARY AIRCRAFT OF NITROGEN GENERATION TO INERT FUEL TANKS AND OXYGEN GENERATION FOR PILOT BREATHING IN A UNIQUE SYSTEM ARRANGEMENT. THESE COMPACT AND LIGHTWEIGHT MEMBRANES LEND THEMSELVES TO A MORE EFFICIENT OBIGGS/OBOGS DESIGN COMBINATION THAN FEASIBLE WITH PREVIOUSLY TESTED MEMBRANES FOR ON-BOARD AIRCRAFT GAS GENERATION. THE PHASE I PROGRAM WILL FOCUS ON ACQUIRING BASIC MEMBRANE PERFORMANCE DATA WHILE OPERATING IN THE DUAL OBIGGS/OBOGS ROLE AND ON PERMEABLE MEMBRANE CARTRIDGE DESIGN AND OPERATING MODES TO DETERMINE THE QUALITY OF THE OXYGEN PRODUCED AND TO ASSESS THE OVERALL SYSTEM WEIGHT, SPACE AND BLEED AIR REQUIREMENTS. ONE OF THE KEYS TO BEING ABLE TO IMPLEMENT THE DUAL OBIGGS/OBOGS CONCEPT IS TO DEMONSTRATE PRODUCTION OF A SUITABLE FLOW AND QUALITY OF OXYGEN USING THE VENTED OEA FROM THE OBIGGS AS THE FEED GAS TO THE OBOGS. IN THIS MANNER THE BLEED AIR REQUIREMENTS WILL BE MINIMIZED. THE OXYGEN PRODUCTION MAY PROCEED BY USE OF MEMBRANE CARTRIDGES AS COLUMNS (I.E., SINGLE STAGE REFLUX SYSTEMS), BY USE OF PRESSURIZED STAGED CARTRIDGES OR BY A COMBINATION OF THESE CARTRIDGE/OPERATING MODE OPTIONS TO PRODUCE THE REQUIRED OXYGEN FLOW/QUALITY WITH THE LOWEST WEIGHT/VOLUME REQUIREMENT. THUS, THE PHASE I PROGRAM WILL BE GEARED AT INDICATING THE PREFERRED CONFIGURATION OF THE OBOGS PORTION OF THE SYSTEM.

ABARIS 1254 ST ALBERTS DR RENO, NV 89503 WILLIAM L MURPHY TITLE: ASSESSMENT OF FIBER REINFORCED PLASTICS FOR COMBATANT SUBMARINE STRUCTURES T 50 OFFICE: NAVSEA	NAVY	\$ 49,983
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FIBER REINFORCED PLASTIC COMPOSITE MATERIALS ARE AVAILABLE WITH A

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SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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VARIETY OF PERFORMANCE FACTORS AND MANUFACTURING METHODS. THERE ARE SEVERAL STRUCTURAL CONCEPTS THAT CAN BE UTILIZED WITH COMPOSITES. THIS PROJECT IS TO PERFORM A FEASIBILITY STUDY TO DETERMINE THE APPLICABILITY OF FIBER REINFORCED PLASTIC COMPOSITE MATERIALS FOR COMBATANT SUBMARINE STRUCTURES. EXAMPLES OF STRUCTURES TO BE ANALYZED ARE THE PRESSURE HULL, HIGH PRESSURE GAS FLASKS, WEAPONS STOWAGE STRUCTURE, CONTROL SURFACES, BED PLATES, PIPE HANGARS AND NON BUILT-IN TANKS. THE SCOPE OF THE CONTRACT WILL LIMIT THE DETAIL THAT CAN BE ACHIEVED. A METHODOLOGY FOR FURTHER ANALYSIS WILL BE DEVELOPED. THE CAPABILITY OF THE COMPOSITES INDUSTRY TO DEVELOP THE STRUCTURE WILL BE ASSESSED. THE WEIGHT SAVINGS THAT CAN BE ACHIEVED WILL BE ESTIMATED, AS WELL AS THE ASSOCIATED TECHNICAL RISKS FOR DEVELOPMENT. AS COMPOSITES ARE SIGNIFICANTLY MORE RESISTANT TO CORROSION THAN METALS, THE POTENTIAL REDUCTION OF LIFE CYCLE COSTS WILL BE STUDIED.

ABEL CO SR 774 - BOX 267 PEMBROKE, VA 24136 KENNETH ABEL TITLE: LOW TEMPERATURE HUMIDITY MEASUREMENT USING LUMINESCENCE QUENCHING T 75 OFFICE: LABCOM/ASL	ARMY	\$ 50,000
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THIS PROPOSAL IS TO INVESTIGATE THE FEASIBILITY OF UTILIZING LUMINESCENCE QUENCHING FOR MEASUREMENT OF RELATIVE HUMIDITY AT TEMPERATURES FOUND IN ARCTIC ENVIRONMENTS. IT IS BASED ON THE OBSERVATION THAT CERTAIN FLUORESCENT AND PHOSPHORESCENT COMPOUNDS, IMMOBILIZED ON SPECIFIC SUBSTRATES, SHOW A LUMINESCENT RESPONSE WHOSE INTENSITY IS PROPORTIONAL TO RELATIVE HUMIDITY OR THE PROPORTION OF WATER VAPOR PRESENT IN THE ATMOSPHERE.

ACCSYS TECHNOLOGY INC 1040 SERPENTINE LN - STE 208 PLEASANTON, CA 94566 ROBERT W HAMM TITLE: SPACE BASED NPB LINAC SYSTEM T 1 OFFICE:	SDIO	\$ 80,490
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THE STRATEGIC DEFENSE INITIATIVE OFFICE IS CONDUCTING RESEARCH ON THE

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AMOUNT

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FEASIBILITY OF USING NEUTRAL PARTICLE BEAMS IN A SPACE-BASED DEFENSE SYSTEM. RADIO-FREQUENCY LINEAR ACCELERATORS (LINACS) ARE USED TO CREATE ENERGETIC, HIGH-BRIGHTNESS NEGATIVE ION BEAMS, WHICH ARE THEN STRIPPED OF THEIR EXCESS ELECTRONS TO FORM NEUTRAL PARTICLE BEAMS (NPB). ALTHOUGH THE BASIC COMPONENTS FOR AN NPB SYSTEM ARE AVAILABLE, SIGNIFICANT REDUCTIONS IN THE SIZE AND REQUIRED POWER WILL BE NECESSARY FOR THE SPACE OPERATION OF A FULL-SCALE SYSTEM. THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO DESIGN A LIGHTWEIGHT, EFFICIENT NPB LINAC DESIGNED FOR SPACE-BASED OPERATION. THIS WILL REQUIRE DETERMINATION OF THE OPTIMUM LINAC OPERATING FREQUENCY NECESSARY TO OBTAIN THE BEAM REQUIREMENTS, AS WELL AS NEW TECHNOLOGY AND MATERIALS FOR MAINTAINING THE MECHANICAL AND ELECTRICAL STABILITY DURING REMOTE SPACE OPERATION. SIMULTANEOUS OPTIMIZATION OF THE LINAC, RF POWER SOURCE, AND PRIMARY POWER SOURCE WILL BE COUPLED WITH NEW MECHANICAL DESIGNS AND CRYOGENIC OPERATING TECHNIQUES TO COMPLETE THE SPECIFICATION OF A SPACE-BASED NPB LINAC SYSTEM.

ACTIVE E-O SYSTEMS INC

AF

\$ 58,399

21 WORTHEN RD

LEXINGTON, MA 02173

DR THOMAS R GURSKI

TITLE:

AUTOMATED AIRBORNE VEHICLE DETECTION AND REPORTING

T 39

OFFICE: ESD/XRCT

LOW FLYING AIRCRAFT CANNOT BE DETECTED BY STANDARD RADAR BECAUSE OF INTERFERENCE FROM CLUTTER. THIS PROPOSAL DESCRIBES A COHERENT LASER RADAR SYSTEM APPROACH, CONSISTING OF 2 km SPACED LASER RADAR SITES THAT SCAN THE SKY IN ELEVATION ANGLE, WHICH CAN DETECT AIRCRAFT BETWEEN THE HORIZON AND 300 METER ALTITUDE. EACH SITE WILL BE BATTERY POWERED AND INTERCONNECTED BY A FIBEROPTIC LOCAL AREA NETWORK TO A CENTRAL RECEIVER SITE. THIS PROPOSED STUDY WILL DEVELOP AN OPTIMUM OPERATIONAL SCENARIO FOR THE SYSTEM, DO SYSTEM SENSITIVITY ANALYSIS BASED ON LESS THAN IDEAL ATMOSPHERIC VISIBILITY CONDITIONS, IDENTIFY KEY HARDWARE COMPONENTS, DETERMINE THEIR SUITABILITY FOR THE PROPOSED SYSTEM, AND INDICATE WHERE FURTHER DEVELOPMENT IS REQUIRED. A PRELIMINARY DESIGN AND TEST PLAN FOR DEMONSTRATION OF THE PROPOSED SYSTEM AT A TEST RANGE WILL BE DEVELOPED.

ADA TECHNOLOGIES INC

AF

\$ 54,137

6973 S-ANDES CIR

AURORA, CO 80016

JAMES R BUTZ

TITLE:

MULTIPLE BURST AIRSLAP LOADING PREDICTIONS FOR THREATS OF CONCERN

T 239

OFFICE: BMO/MYSC

A PROJECT IS PROPOSED WHERE EXISTING MODELS ARE USED TO PREDICT THE

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<p>EFFECT OF MULTIPLE BURST AIRSLAP ON HARDENED SILOS. A SMALL NUMBER OF THREAT/TARGET CONFIGURATIONS WILL BE SELECTED AS REPRESENTATIVE OF THOSE OF GREATEST INTEREST OR AS BOUNDING THE AIRSLAP PROBLEM. THE MODELS WILL BE EVALUATED AND MATCHED TO THE THREAT/TARGET CASES FOR OPTIMUM PERFORMANCE. THE PREDICTIONS WILL BE TABULATED AS A REFERENCE. FOR SOME CASES, SEVERAL MODELS WILL BE APPLIED, AND THE PREDICTIONS COMPARED AS AN EVALUATION OF THE MODEL PERFORMANCE. FINALLY MODIFIED VALUES FOR THE GEOPHYSICAL PROPERTIES OF THE LOCAL GEOLOGY WILL BE USED TO SIMULATE THE EFFECT OF A FIRST ATTACK. A SECOND STRIKE THREAT WILL THEN BE RUN FOR THE CASES, TO OBTAIN PREDICTIONS OF THE IMPACT OF THE ALTERED GEOPHYSICAL PROPERTIES ON THE SECOND STRIKE. A PARAMETRIC SET OF VALUES OF THE GEOPHYSICAL PROPERTIES WILL BE INPUT TO PUT BOUNDS ON THE PERCEIVED PROBLEM. IN ADDITION, THE USE OF VELOCITY INVERSION (A MATHEMATICAL TECHNIQUE) TO OBTAIN ACTUAL VALUES OF GEOPHYSICAL PROPERTIES FROM ANALYSIS OF SEISMIC DATA OF NUCLEAR AND HIGH EXPLOSIVE SIMULATIONS OF NUCLEAR TESTS WILL BE EXPLORED. AVAILABLE DATA WILL BE IDENTIFIED AND EXAMINED TO DETERMINE THE FEASIBILITY OF APPLYING THIS TECHNOLOGY IN A NEW WAY.</p>		

ADDMASTER CORP 2000 S MYRTLE AVE MONROVIA, CA 91016 DR JOHN P CLARY TITLE: DISTRIBUTED DIGITAL CONTROLLER ARCHITECTURE FOR ADAPTIVE CONTROL T 120	NAVY	\$ 50,000
OFFICE: NSWC		

DIGITAL CONTROL, AND ESPECIALLY ADAPTIVE CONTROL, IS DIFFICULT TO IMPLEMENT FOR HIGH-BANDWIDTH SERVO-LOOP BECAUSE OF THE EXTREMELY HIGH DATA RATES INVOLVED. TO REDUCE THE COMPUTATIONAL BURDEN, THE USUAL COMPROMISING SOLUTION IS TO USE REDUCED ORDER MODELS FOR THE PLANT AND THEN REDUCE THE CLOSED-LOOP SYSTEM'S BANDWIDTH. THIS RESEARCH INVESTIGATES THE FEASIBILITY OF A NEW ARCHITECTURE FOR DIGITAL CONTROLLERS WHICH CAN SUPPORT THE DATA RATES NOW PRESENT AND EXPECTED IN HIGH-BANDWIDTH SERVO-LOOPS. THE PROCESSING REQUIREMENTS ARE DISTRIBUTED AMONG AN ARRAY OF INTELLIGENT MODULES, EACH OF WHICH IS CAPABLE OF SEMI-AUTONOMOUS OPERATION. A MICROPROCESSOR BASED SUPERVISOR ADMINISTRATES AND MONITORS THE COMPUTATIONAL TASKS OF THE DISTRIBUTED PROCESSORS. ANTICIPATED PHASE I RESULTS ARE THE CONCEPTUAL DESIGN OF A COMPACT PROGRAMMABLE GENERAL PURPOSE DIGITAL CONTROLLER WHICH CAN CONTROL HIGH-BANDWIDTH SERVO-LOOPS USING DIGITAL (ADAPTIVE OR NOT)

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CONTROL ALGORITHMS. PHASE II EFFORTS WILL LEAD TO A COMPLETED SYSTEM FOR THESE APPLICATIONS.

ADTECH SYSTEMS RESEARCH INC 211 N BROAD ST FAIRBORN, OH 45324 SOM R SONI TITLE: FAILURE MECHANISMS IN COMPOSITE TURBINE BLADES T 156 OFFICE: AFWAL/ML	AF	\$ 49,981
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BECAUSE OF THE COMPLEXITY OF GEOMETRY, LOADS AND MATERIAL SYSTEMS OF TURBINE BLADES, THE STRESS AND STRENGTH CHARACTERISTICS CAN NOT BE ACCURATELY PREDICTED BY EXISTING METHODS. THE COMPOSITE TURBINE BLADE STRENGTH CAPABILITIES ARE VERY MUCH DEPENDENT UPON THE CONSTITUENT MATERIAL PROPERTIES, PLY ORIENTATIONS AND STACKING SEQUENCE. THE OBJECTIVE OF THE PROPOSED STUDY IS TO DEVELOP A TECHNIQUE TO PREDICT THE DIFFERENT FAILURE MODES IN THE COMPOSITE TURBINE BLADE. THE EFFECT OF STACKING SEQUENCE, PLY ORIENTATIONS, CENTRIFUGAL FORCE AND AIR PRESSURE ON THE FAILURE OF TURBINE BLADES WILL BE STUDIED. THE SOLUTION TO THE BOUNDARY VALUE PROBLEM WILL BE OBTAINED BY USING LINEAR ELASTICITY EQUILIBRIUM AND CONSTITUTIVE RELATIONS. EACH LAYER WILL BE MODELED SEPARATELY. THE USE WILL BE MADE OF THE EXPERIENCE GAINED IN THE EXTENSIVE RESEARCH WORK DONE ON INPLANE AND INTERLAMINAR FAILURE MODES. THE PROPOSED STUDY WILL REVEAL INTERESTING FEATURES OF TURBINE BLADES. SOME PRELIMINARY WORK DONE ON THE PROBLEM ON THE BASIS OF NEW APPROACH ARE GIVEN IN THE PROPOSAL. IN THIS STUDY, ALL THE STRESS COMPONENTS (SIX) WILL BE CALCULATED AND USED IN THE STRENGTH PREDICTIONS.

ADVANCED COMPOSITE PRODUCTS INC 37 WASHINGTON AVE EAST HAVEN, CT 06512 DAVID MAASS TITLE: MATERIAL AND PROCESS DEVELOPMENT OF NOVEL GRAPHITE/THERMOPLASTIC YARN AND RELATED FORMS T 162 OFFICE: AFWAL/ML	AF	\$ 84,637
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THE OBJECTIVE OF THIS EFFORT IS TO DEVELOP BOTH TEXTILE FORMS AND

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AMOUNT

ASSOCIATED PROCESSING METHODS FOR A NEW THERMOPLASTIC COMPOSITE MATERIAL FORM KNOWN AS "HYBRID YARN". THIS MATERIAL, CONSISTING OF A FINE MIXTURE OF GRAPHITE AND THERMOPLASTIC FILAMENTS, ALLOWS FOR A FLEXIBLE AND CONFORMAL RAW MATERIAL FORM WHICH HAS THE POTENTIAL TO BE BROADLY USED IN AIRCRAFT STRUCTURAL COMPONENTS. IT OFFERS DRAMATICALLY REDUCED PART FABRICATION LABOR, TOUGHNESS, AND REPAIRABILITY. A CAREFULLY CONTROLLED PROCESS STUDY IS TO BE PERFORMED WITH THREE TEXTILE FORMS OF INTEREST FOR BOTH CONSOLIDATION AND FORMING BY TWO DIFFERENT METHODS. MECHANICAL AND PHYSICAL PROPERTIES SHALL BE CHARACTERIZED. IT IS ANTICIPATED THAT AT THE CONCLUSION OF PHASE I, A SPECIFIC HYBRID THERMOPLASTIC MATERIAL FORM AND RELATED MANUFACTURING METHOD SHALL HAVE BEEN DEVELOPED WITH GENERIC APPLICABILITY TO AIRCRAFT STRUCTURAL PARTS.

ADVANCED COMPOSITE PRODUCTS INC

AF

\$ 71,758

37 WASHINGTON AVE

EAST HAVEN, CT 06512

DAVID MAASS

TITLE:

A COMPOSITE IMPROVED MAU-12 BOMB EJECTOR RACK ASSEMBLY DEVELOPMENT

T 27

OFFICE: AFATL/FXV

THERMOPLASTIC COMPOSITE MATERIALS SUCH AS GRAPHITE/PPS OFFER THE POTENTIAL TO REDUCE WEIGHT AND ENVIRONMENTAL CORROSION IN MILITARY BOMB RACKS. THIS PROGRAM IS DESIGNED TO APPLY THOSE BENEFITS TO THE MAU-12 AIRCRAFT BOMB EJECTOR RACK ASSEMBLY. AFTER A REVIEW OF AVAILABLE DATA, SEVERAL METAL COMPONENTS OF THE EXISTING BOMB RACK WILL BE SELECTED FOR COMPOSITE DESIGN. ONE OF THESE WILL BE BUILT AND TESTED TO DEMONSTRATE PRODUCEABILITY AND WEIGHT SAVINGS. A FINAL REPORT IS PROVIDED WHICH SUMMARIZES THIS EFFORT AND PROVIDES GUIDELINES FOR PHASE II DEVELOPMENT.

ADVANCED COMPOSITE PRODUCTS INC

ARMY

\$ 81,964

37 WASHINGTON AVE

EAST HAVEN, CT 06512

DAVID MAASS

TITLE:

LIGHTWEIGHT DURABLE THERMOPLASTIC SANDWICH PANEL ROADWAY SURFACE FOR MILITARY BRIDGE BITE ACCESS/EGRESS DEVELOPMENT

T 97

OFFICE: BRDC

THERMOPLASTIC COMPOSITES SUCH AS FIBERGLASS/PPS ARE STRONG,

FISCAL YEAR 1986

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AMOUNT

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LIGHTWEIGHT, TOUGH MATERIALS SUITABLE FOR HARSH ENVIRONMENTS WHERE WEIGHT SAVINGS AND DURABILITY ARE REQUIRED. THIS PROGRAM IS DESIGNED TO APPLY THOSE BENEFITS TO TEMPORARY ROADWAY SURFACES FOR MILITARY BRIDGE SITE ACCESS/EGRESS. AFTER A REVIEW OF PRIOR WORK, ESPECIALLY TESTING OF SANDWICH PANELS, IMPROVED PANEL UTILIZING FIBERGLASS/PPD SKINS, ALUMINUM HONEYCOMB CORE AND INTEGRAL TRACTION CLEATS WILL BE DESIGNED. SMALL SAMPLES WILL BE BUILT AND TESTED TO COMPARE DURABILITY WITH PREVIOUS DESIGNS AND MEASURE WEIGHT SAVINGS. A FINAL REPORT IS PROVIDED WHICH SUMMARIZES THIS EFFORT AND PROPOSES GUIDELINES FOR PHASE II DEVELOPMENT.

ADVANCED COMPOSITE PRODUCTS INC

ARMY

\$ 90,000

37 WASHINGTON AVE

EAST HAVEN, CT 06512

DAVID MAASS

TITLE:

NOVEL THERMOPLASTIC COMPOSITE MATERIAL FORMS FOR PRIMARY AIRCRAFT STRUCTURE

T 41

OFFICE: AVSCOM/AMSAV

THE OBJECTIVE OF THIS EFFORT IS TO DEMONSTRATE THE FEASIBILITY OF USING A "HYBRID YARN" CONSISTING OF A MIXTURE OF GRAPHITE AND THERMOPLASTIC FILAMENTS TO FABRICATE A PRIMARY STRUCTURAL COMPONENT TYPICAL OF CURRENT AND FUTURE ARMY COMPOSITE AIRFRAME STRUCTURES. THE RESULTING THERMOPLASTIC MATRIX COMPOSITE MATERIAL IS ANTICIPATED TO HAVE THE SAME IMPROVEMENTS IN TOUGHNESS AND REPAIRABILITY THAT CHARACTERIZE EXISTING THERMOPLASTIC COMPOSITE MATERIALS, BUT ALSO TO ENABLE FAR QUICKER AND LESS COSTLY FABRICATION METHODS. AFTER A SURVEY AND SELECTION OF AN APPROPRIATE HELICOPTER AIRFRAME COMPONENT, A THERMOPLASTIC COMPOSITE DESIGN SHALL BE CREATED USING PRELIMINARY MECHANICAL PROPERTY DATA GENERATED UNDER THIS EFFORT. A PROTOTYPE PART IS TO BE FABRICATED AND STATICALLY TESTED FOR DESIGN AND PROPERTY VERIFICATION.

ADVANCED COMPOSITES LABS

NAVY

\$ 48,810

PO BOX 117

WEST NEWTON, MA 02165

WARREN W HOUGHTON

TITLE:

IMPROVED MILITARY MOUNTAINEERING SKI DEVELOPMENT

T 13

OFFICE: USMC/LBC

ADVANCED COMPOSITES LABORATORIES WILL DEVELOP AN IMPROVED



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>MOUNTAINEERING SKI FOR MILITARY USE. WE WILL INCORPORATE THE BEST OF DOWNHILL SKI TECHNOLOGY WITH THE BEST OF TELEMAR AND MOUNTAINEERING SKI TECHNOLOGY TO PRODUCE A SKI FOR THE US MARINE CORPS WHICH WILL MEET THE REQUIREMENTS OF THE MARINE CORPS TOPICS N86-13. WE WILL USE ADVANCED COMPOSITE MATERIALS TO ALLOW US TO PROVIDE A HIGH PERFORMANCE SKI WITH THE LIGHTEST POSSIBLE WEIGHT AND UNSURPASSABLE DURABILITY. ACL WILL USE MODERN TECHNIQUES OF DYNAMIC MODAL ANALYSIS TO ASSIST US IN ACHIEVING THE DESIRED SKI DYNAMICS. WE WILL INVESTIGATE THE USE OF A VARIETY OF DYNAMIC TUNING SYSTEMS, INCLUDING ON-SKI TUNING POINTS, CENTER RIBBED SKI'S AND VIBRATION ABSORBING DAMPING SYSTEMS. ACL WILL ALSO DETERMINE WHICH BASE MATERIAL AND BASE PATTERN WILL MEET THE USMC REQUIREMENTS FOR A WAXLESS SKI. POSITIVE BASE PATTERNS, FIBRILLAR BASE PATTERNS AND NEGATIVE BASE PATTERNS WILL BE EVALUATED FOR NOISE, GRIP, GLIDE AND DURABILITY. IF COMMERCIALLY AVAILABLE MATERIALS ARE NOT SUITABLE, WE WILL DEVELOP A SUITABLE BASE USING OUR ADVANCED POLYMER TECHNOLOGY. A SKI COMPATIBLE WITH THE USMC VAPOR BARRIER BOOT WITH A LENGTH BETWEEN 140 AND 180 CM WILL BE DESIGNED AND A PROTOTYPE WILL BE FABRICATED AND TESTED.</p>		

ADVANCED DECISION SYSTEMS 201 SAN ANTONIO CIRCLE - STE 286 MOUNTAIN VIEW, CA 94040 DR R M TONG TITLE: PERFORMANCE EVALUATION OF ARTIFICIAL INTELLIGENCE SYSTEMS T 16 OFFICE: DARPA	DARPA	\$ 49,992
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AS THE DoD IS MOVING TOWARDS THE LARGE-SCALE USE OF ARTIFICIAL INTELLIGENCE SYSTEMS FOR SUPPORTING DECISION-MAKING AND INFORMATION ANALYSIS, IT BECOMES INCREASINGLY IMPORTANT THAT WE DEVELOP MECHANISMS FOR ASSESSING THE PERFORMANCE OF THESE SYSTEMS. WE BELIEVE THAT ASKING "HOW INTELLIGENT IS THE SYSTEM?" IS NOT THE CORRECT PERFORMANCE QUESTION AND THAT MORE APPROPRIATE ARE "DOES THE SYSTEM HELP THE USER?" "IN WHAT WAY?" AND "HOW CAN THIS BE MEASURED?" OUR APPROACH IS BASED ON THE PREMISE THAT THE USERS, DEVELOPERS, MANAGERS AND FUNDERS OF THESE SYSTEMS HAVE "EXPERT" KNOWLEDGE ABOUT PERFORMANCE AND EVALUATION THAT NEEDS TO BE CAPTURED IF A COMPREHENSIVE EVALUATION IS TO BE PERFORMED. THE METHODOLOGY WE PROPOSE STRUCTURES THIS KNOWLEDGE BY USING A HIERARCHY OF EVALUATION CONTEXTS, USES A RULE-BASED LANGUAGE FOR EXPRESSING THE KNOWLEDGE, AND EMPLOYS THE

FISCAL YEAR 1986

SUBMITTED BY

DEPT

AWARDED  
AMOUNT

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MATHEMATICS OF FUZZY SET THEORY TO MODEL THE INHERENT VAGUENESS IN THE KNOWLEDGE. THE PROPOSAL CONTAINS AN OVERVIEW OF OUR EVALUATION METHODOLOGY AND ILLUSTRATES IT WITH A SIMPLE EXAMPLE. WE ALSO DISCUSS THE NEED TO DESIGN A SET OF TOOLS TO HELP OPERATIONALIZE THE METHODOLOGY, AND CONSIDER SOME PILOT EXPERIMENTS THAT SHOULD BE PERFORMED TO VALIDATE THE IDEAS.

ADVANCED DECISION SYSTEMS  
201 SAN ANTONIO CIRCLE - STE 286  
MOUNTAIN VIEW, CA 94040  
DR CHEE-YEE CHONG

DARPA

\$ 50,004

TITLE:

DISTRIBUTED ELECTRONIC SIGNAL UNDERSTANDING ADS  
T 22 OFFICE: DARPA

THE USE OF MULTIPLE SENSORS FOR ELECTRONIC SIGNAL UNDERSTANDING HAS IMPORTANT ADVANTAGES. MULTIPLE VIEWING ANGLES CAN PROVIDE MULTIPLE DIRECTION FINDING, MULTIPLE DOPPLER MEASUREMENTS FOR TARGET VELOCITY DETERMINATION, ROBUSTNESS AGAINST TERRAIN MASKING/SPOOFING, ETC. ALTHOUGH THE DATA FROM MULTIPLE SENSORS CAN BE SENT TO A CENTRAL SITE FOR PROCESSING, A DISTRIBUTED ELECTRONIC SIGNAL UNDERSTANDING SYSTEM WITH MULTIPLE PROCESSING NODES HAS BENEFITS SUCH AS LESS VULNERABILITY, REDUCED COMMUNICATION, ETC. THE PROPOSED RESEARCH WILL INVESTIGATE THE TECHNICAL FEASIBILITY OF SUCH A SYSTEM. THE MAIN TECHNOLOGY NEEDED IS DISTRIBUTED EVIDENTIAL REASONING FOR SITUATION ASSESSMENT. EACH NODE PROCESSES ITS OWN DATA AND COOPERATES WITH OTHER NODES TO IMPROVE ON THE SITUATION ASSESSMENT. THE PROPOSED RESEARCH WILL ANALYSE THE PROBLEM, IDENTIFY THE KEY RESEARCH ISSUES, AND DEMONSTRATE THE CONCEPT OF SUCH A DISTRIBUTED SYSTEM.

ADVANCED DECISION SYSTEMS  
201 SAN ANTONIO CIR - STE 286  
MOUNTAIN VIEW, CA 94040  
DR DARYL T LAWTON

AF

\$ 90,000

TITLE:

SYMBOLIC RF SIGNATURE PREDICTION  
T 113 OFFICE: AFWA/AA

THIS EFFORT WILL ASSESS THE TECHNICAL STATE OF THE ART FOR MODEL-BASED VISION APPROACHES TO ANALYZING RADAR AND OTHER ACTIVE SENSOR

FISCAL YEAR 1986

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IMAGERY. MODEL-BASED APPROACHES RELY HEAVILY ON USING SEMANTIC MODELS TO PREDICT IMAGE OBJECTS AND FEATURES IN A MANNER THAT FACILITATES RECOGNITION OF THE OBJECT IN THE IMAGE. TO DATE, RESEARCH IN THIS AREA HAS FOCUSED PREDOMINATELY ON OPTICAL IMAGERY. THE STUDY WILL DEVELOP A RESEARCH PLAN DESCRIBING AN APPROACH TO BRING MODEL-BASED VISION TECHNIQUES FOR RADAR IMAGE ANALYSIS TO FRUITION. THIS WILL BE ACCOMPLISHED BY REVIEWING RELEVANT TECHNOLOGY, CREATING A BIBLIOGRAPHY OF APPLICABLE RESEARCH, DEFINING KEY TAXONOMIES AND CHARACTERISTICS OF THE TECHNICAL ISSUES, AND IDENTIFYING STRENGTHS AND WEAKNESSES (OR GAPS) IN CURRENT CAPABILITIES. A KEY TASK IN ACCOMPLISHING THESE GOALS WILL BE THE ORGANIZATION OF A WORKSHOP ADDRESSING MODEL-BASED VISION FOR ACTIVE SENSORS WITH AN EMPHASIS ON PREDICTIVE AND MODEL REPRESENTATION.

ADVANCED DECISION SYSTEMS	ARMY	\$ 92,435
201 SAN ANTONIO CIR - STE 286		
MOUNTAIN VIEW, CA 94040		
DR JAY GLICKSMAN		
TITLE:		
SPATIAL DATA STRUCTURES FOR ROBOTIC VEHICLE ROUTE PLANNING		
T 186	OFFICE: ETL/COE	

ADS IS PROPOSING TO DEVELOP OBJECT-ORIENTED, SCHEMA-BASED DATA STRUCTURES FOR REPRESENTING TERRAIN DATA. THESE DATA STRUCTURES CAN SATISFY DEMANDING SPACE AND TIME CONSTRAINTS BY MINIMIZING PAGING IN A VIRTUAL MEMORY SYSTEM. THIS WILL BE ACCOMPLISHED BY COMPACTLY REPRESENTING THE DATA IN A FORMAT DIRECTLY RELEVANT TO THE ROUTE PLANNING APPLICATIONS. THE SCHEMATA EXPLICITLY REPRESENT THREES ASPECTS OF TERRAIN FEATURES: SPATIAL ATTRIBUTES, WHICH ARE BUILT UPON TWO-DIMENSIONAL, MULTI-RESOLUTION DESCRIPTIONS OF CURVES AND REGIONS AUGMENTED WITH ELEVATIONS AT FEATURE POINTS; NON-SPATIAL ATTRIBUTES; AND RELATIONS AMONG THE SCHEMATA (E.G., ADJACENCY). IMAGE ANALYSIS ROUTINES WILL BE USED TO EXTRACT TERRAIN FEATURES FROM THE RAW DATA. THE DATA STRUCTURES WILL BE TAILORED TO THE APPLICATIONS SO THAT PLANNING ALGORITHMS USING AI TECHNIQUES (E.G., GRAPH SEARCH) WILL HAVE READY ACCESS TO PERTINENT DATA. THE PHASE I EFFORT WILL USE EXISTING ADS TOOLS TO DESIGN AND IMPLEMENT A PARTIAL DATA BASE FOR REPRESENTATIVE FEATURES FROM A REAL SOURCE OF TERRAIN DATA. DUE TO THE MODULAR NATURE OF THE SCHEMATA THESE DATA STRUCTURES WILL BE COMPATIBLE WITH PHASE II GOALS FOR DYNAMIC UPDATES.

FISCAL YEAR 1986

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ADVANCED DEVICE TECHNOLOGY INC 3 BUDWAY - UNIT 29 NASHUA, NH 03063 DR PETER J KANNAM TITLE: IMPROVED PROCESSING METHODS FOR HgCdTe INFRARED DETECTOR ARRAYS T 65 OFFICE: CECOM/AMSEL	ARMY	\$ 49,500

IMPROVED PROCESSING METHODS FOR THE MANUFACTURING OF HgCdTe INFRARED DETECTORS ON EPITAXIAL MATERIAL IS ADDRESSED IN THIS PROPOSAL. THE GOAL OF PHASE I OF THE PROGRAM IS TO DEVELOP PROCESSING TECHNIQUES ADEQUATE FOR THE PRODUCTION OF 64 X 64 ELEMENT FACAL PLANE ARRAYS. THE DEVICE IS DESIGNED TO SHOW PERFORMANCE LEVEL AT AN ORDER OF MAGNITUDE HIGHER THAN THAT CURRENTLY ACHIEVED. THIS IS ACCOMPLISHED BY INTRODUCING NEW DESIGN FEATURES SUCH AS MULTIPLE LAYER EPITAXIAL STRUCTURE, DOUBLE LAYER SURFACE PASSIVATION, AND TRI-METAL CONTACT SCHEME. THE PRODUCTION COST IS EXPECTED TO BE 50% LOWER THAN THE EXISTING TECHNOLOGY, DUE TO THE ELIMINATION OF SEVERAL PROCESS STEPS THAT ARE DETRIMENTAL TO THE DEVICE PERFORMANCE. THE DETECTOR IS DESIGNED TO GIVE IMPROVED STABILITY AND THERMAL DISSIPATION DUE TO THE ABSENCE OF EPOXY BONDING LAYER BETWEEN THE DETECTOR ARRAY AND THE SUBSTRATE MATERIAL.

ADVANCED DIGITAL SYSTEMS INC 10975 TORREYANNA RD - STE 200 SAN DIEGO, CA 92121 ROBERT MILNE TITLE: ENHANCED HF PROPAGATION PREDICTION T 32 OFFICE: SPAWAR	NAVY	\$ 49,703
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THE OBJECTIVE OF THE PROPOSED STUDY IS TO PROVIDE FOR THE VERY FAST EXECUTION OF THE MINIMUF 3.1 HF PROPAGATION ALGORITHM WITHIN A PERSONAL COMPUTER. THE EXECUTION TIME GOAL FOR A LATITUDE-LONGITUDE POINT PAIR COMPUTATION IS 1 MILLISECOND OR LESS. THE APPROACH IN THIS PROPOSAL TO ACHIEVE THIS EXECUTION TIME CONSISTS OF TWO ELEMENTS. THE FIRST ELEMENT IS TO MINIMIZE THE NUMBER OF COMPUTATIONS NECESSARY FOR DETERMINING THE SENSITIVITY OF INPUT VARIABLES TO THE MUF COMPUTATION. COMPUTATION WILL NOT BE PERFORMED FOR VARIABLES KNOWN TO RESULT IN A MUF GREATER THAN 32 MHz. THE SECOND ELEMENT IS TO PROVIDE A STATE-OF-THE-ART PROGRAMMABLE PERIPHERAL CARD USING ONE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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OR MORE ARITHMETIC PROCESSORS CAPABLE OF SATISFYING THE EXECUTION TIME REQUIRMENTS.

ADVANCED DIGITAL SYSTEMS INC 10975 TORREYANNA RD - STE 200 SAN DIEGO, CA 92121 DR SAN-YEN SHIH TITLE: MILSTAR SDI COMMAND CONTROL AND COMMUNICATIONS NETWORKING CONCEPTS T 94 OFFICE: ASD/XR	AF	\$ 48,398
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THE OBJECTIVE OF THE PROPOSED STUDY IS TO ANALYZE THE FEASIBILITY OF MILSTAR INTEGRATION INTO THE SDI SYSTEM. THE ANALYSIS WILL ADDRESS THE POTENTIAL ROLES WHICH MILSTAR COULD SERVE AND THE ADVANTAGES AND DISADVANTAGES WHICH COULD BE ENCOUNTERED WITH SUCH A MERGER.

ADVANCED FIBEROPTICS CORP 637 S HAYDEN RD TEMPE, AZ 85281 DR ALBERT H WEY TITLE: DIRECT GROWTH/FUSION CIRCUITRY DEVICES ON OPTICAL FIBER T 49 OFFICE: CECOM/AMSEL	ARMY	\$ 50,000
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THE OBJECTIVE OF THIS PROJECT IS TO EVALUATE THE FEASIBILITY OF GROWTH OR FUSION OF OPTOELECTRONIC DEVICES DIRECTLY ONTO THE OPTICAL FIBER. THIS APPROACH WILL HAVE SIGNIFICANT IMPLICATION AND BENEFITS ON FUTURE FIBER OPTIC COMMUNICATIONS. TO ACHIEVE THE OBJECTIVE, A COMPLETE LITERATURE SEARCH RELATED TO THE TOPIC WILL BE COMPILED. A THEORETICAL ANALYSIS ON ALL POSSIBLE DESIGNS WILL BE INVESTIGATED. THE MATERIAL COMPATIBILITY, ENVIRONMENTAL EFFECT, RELIABILITY AND PROCESSING TECHNIQUES WILL BE INVESTIGATED AND EVALUATED. AN EXPERIMENTAL TRYOUT WILL ALSO BE DONE ON SOME CONCEPTUAL DESIGN AND PROCESS IF TIME AND FUNDING ALLOWS.

ADVANCED MATERIALS LAB INC 110 HILLCREST RD CONCORD, MA 01742 DR THOMAS L ALTSHULER TITLE: BEHAVIOR OF METAL MATRIX COMPOSITES AT CRYOGENIC TEMPERATURES T 112 OFFICE: NSWC	NAVY	\$ 49,784
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METAL MATRIX COMPOSITES THAT MAY BE USED IN DEEP SPACE VEHICLES MIGHT

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>HAVE SEVERE INTERNAL STRESSES DUE TO THE THERMAL EXPANSION DIFFERENCES BETWEEN THE MATRIX AND THE FIBERS. SINCE THE TEMPERATURES EXPERIENCED WITH THESE VEHICLES MAY BE AS LOW AS A FEW DEGREES ABOVE ABSOLUTE ZERO, IT IS NECESSARY TO KNOW THE THERMAL MECHANICAL BEHAVIOR OF METAL MATRIX COMPOSITES TO BE USED AS STRUCTURAL MATERIALS. THE PURPOSE OF THIS PROPOSED EFFORT IS TO BUILD A CRYOSTAT CAPABLE OF MECHANICALLY TESTING THESE MATERIALS FROM ROOM TEMPERATURE DOWN TO LIQUID HELIUM TEMPERATURES, APPROXIMATELY 4 DEGREES KELVIN. BOTH COMPRESSION AND TENSILE TESTS WOULD BE DONE. A PHASE II EFFORT WOULD BE DESIRABLE FOR DEVELOPING A DATA BASE OF MECHANICAL PROPERTIES OF MATERIALS AT CRYOGENIC TEMPERATURES.</p>		

ADVANCED METALWORKING PRACTICES INC 4204 MICHAEL DR KOKOMO, IN 46902 KISHOR M KULKARNI TITLE: A NOVEL PROCESS FOR NEAR NET SHAPE TITANIUM TANKS T 148	NAVY	\$ 49,550
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OFFICE: NWSC

FABRICATION OF PROPELLANT TANKS INVOLVES COSTLY EXTENSIVE MACHINING OF THICK Ti-6Al-4V FORGINGS. TWO PROMISING APPROACHES FOR Ti-15V-3Cr-3Sn AND HOT SUPERPLASTIC FORMING (SPF) OF Ti-6Al-4V. SPF REQUIRES LOW FORMING PRESSURE, HAS EXCELLENT SHAPE CAPABILITY AND IS APPLICABLE TO WELL ESTABLISHED Ti-6Al-4V. BUT, IT REQUIRES COSTLY TOOLING AND HEATING SYSTEMS. THE PROPOSED PROGRAM WILL INVESTIGATE A NOVEL CONCEPT FOR HEATING AND TOOLING SYSTEMS FOR SUPERPLASTIC FORMING. THE TITANIUM SHEET WILL BE HEATED DIRECTLY WITH LOW HEAT LOSS TO TOOLING. THE PROCESS WILL BE ENERGY EFFICIENT, REDUCE USAGE OF HEAT RESISTANT MATERIALS FOR TOOLING AND ELIMINATE NEED FOR LARGE PRESSES. THE PROCESS FEASIBILITY WILL BE EVALUATED BY MAKING 6 IN. DIAMETER HEMISPHERES FROM 0.070 IN. THICK Ti-6Al-4V. PARAMETERS SUCH AS WORK MATERIAL AND TOOLING TEMPERATURES, FORMING PRESSURE AND DEFORMATION WILL BE MONITORED. STARTING AND FINAL MICROSTRUCTURES WILL BE EVALUATED. DATA WILL BE COLLECTED TO JUDGE THE PROCESS FEASIBILITY AND SCALE UP POSSIBILITY.

ADVANCED PLASMA TECHNOLOGIES 2122 WALTONIA DR MONTROSE, CA 91020 DR GREAME ASTON TITLE: HIGH POWER ELECTRIC PROPULSION CONCEPTS ASSESSMENT FOR ENHANCED MISSION CAPABILITY T 6	SDIO	\$ 96,585
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OFFICE:

HIGH SPECIFIC IMPULSE ELECTRIC PROPULSION CONCEPTS WILL BE INVESTI-

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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GATED FOR OPERATION IN THE 0.1-5 MW POWER RANGE TO SUBSTANTIALLY REDUCE PROPELLANT MASS REQUIREMENTS AND SUBSEQUENT COST, OVER CHEMICAL PROPULSION, FOR ORBIT TRANSFER FROM LOW EARTH ORBIT, STATION KEEPING AND SUBTLE EVASIVE MANEUVERING OF SDI PAYLOADS. A DATA BASE DOCUMENTING DIFFERENT ELECTRIC PROPULSION CONCEPTS WILL BE DEVELOPED WHICH WILL INCLUDE A TECHNICAL ASSESSMENT OF THE PRESENT STATE OF TECHNOLOGY AND THE FEASIBILITY OF USING THESE CONCEPTS AT INPUT POWER LEVELS FROM 0.1-5 MW. SYSTEM SCALING RELATIONSHIPS AND PERFORMANCE PROJECTION EXPRESSIONS WILL BE DERIVED AND PARAMETRIC TRADE-OFF STUDIES PERFORMED FOR POTENTIAL SDI ELECTRIC PROPULSION MISSION APPLICATIONS. KEY TECHNOLOGY DRIVER ISSUES WILL BE IDENTIFIED AND DEVELOPMENT PROGRAMS FORMULATED, INCLUDING MOST MAJOR MILESTONES, FOR SUCCESSFUL IMPLEMENTATION OF THIS TECHNOLOGY.

ADVANCED REFRACTORY TECHNOLOGIES INC 699 HERTEL AVE. BUFFALO, NY 14207 DR PETER SHAFFER	SDIO	\$ 77,468
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## TITLE:

SYNTHESIS OF ULTRAHIGH PURITY SUBMICRON BORON CARBIDE POWDERS

T 11 OFFICE:

MATERIALS FOR SPACECRAFT STRUCTURES ARE REQUIRED WHICH POSSESS HIGH STIFFNESS TO WEIGHT RATIOS, ALONG WITH CHEMICAL AND DIMENSIONAL STABILITY IN SPACE ENVIRONMENTS. B(4)C HAS ONE OF THE HIGHEST RATIOS AND CAN BE FABRICATED INTO DENSE BODIES. OPTIMAL COMPONENT PERFORMANCE WILL LIKELY REQUIRED AN IMPROVED B(4)C POWDER WHICH IS NOT AVAILABLE COMMERCIALY NOW. A PROPRIETARY HIGH TEMPERATURE REACTOR HAS BEEN OPERATED WHICH CAN PRODUCE ULTRAHIGH PURITY, SUBMICRON POWDERS. APPLICATION OF THIS REACTOR TECHNOLOGY TO THE SYNTHESIS OF B(4)C POWDERS SHOULD RESULT IN IMPROVED MATERIALS - BOTH CERAMICS AND COMPOSITES - FOR SPACE STRUCTURES.

ADVANCED REFRACTORY TECHNOLOGIES INC 699 HERTEL AVE BUFFALO, NY 14207 PETER T B SHAFFER	NAVY	\$ 48,658
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## TITLE:

IMPROVED MATERIALS FOR CERAMIC ARMOR FABRICATION

T 118 OFFICE: NSW

THE ABILITY TO FABRICATE CERAMIC ARMOR ECONOMICALLY IS DEPENDENT

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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UPON SEVERAL FACTORS INCLUDING POWDER COST, FABRICATION TECHNIQUE, AND FINAL MACHINING COST. CANDIDATE CERAMIC SUCH AS  $TiB(2)$ , AND  $B(4)C$  DO NOT SINTER TO FULL DENSITY. THEREFORE, NEAR-NET SHAPE FORMATION IS DIFFICULT AND EXPENSIVE, ESPECIALLY WHERE COMPLEX GEOMETRIES ARE INVOLVED. ART PROPOSES TO UTILIZE NEW POWDER SYNTHESIS TECHNOLOGY TO PRODUCE SINTERABLE CERAMIC POWDERS FOR USE AS ARMOR MATERIALS. THEIR COMPOSITION WILL BE SOLID SOLUTIONS OF VARIOUS CANDIDATE MATERIALS SUCH AS  $TiB(2)$ ,  $TiC$ ,  $B(4)C$ , AND SO ON.

ADVANCED RESEARCH & APPLICATIONS CORP 1223 E ARQUES AVE SUNNYVALE, CA 94086 L N KOPPEL	SDIO	\$ 83,331
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## TITLE:

ADVANCED SOLID STATE NEUTRON DETECTOR DEVELOPMENT FOR NPB MASS DISCRIMINATION

T 3 OFFICE:

THE DEVELOPMENT AND EVALUATION OF ADVANCED FAST-NEUTRON SENSORS BASED ON THE CONVERTER/METAL-OXIDE-SILICON-CAPACITOR (MOSC) APPROACH IS PROPOSED. THE SENSORS PROMISE IMPROVED TECHNICAL PERFORMANCE AND COST-EFFECTIVENESS AS COMPONENTS OF THE NEUTRAL PARTICLE BEAM (NPB) MASS DISCRIMINATION SYSTEM BEING DEVELOPED BY SDIO. THE GOAL OF THE OVERALL PROJECT IS TO CONSTRUCT AND EXPERIMENTALLY EVALUATE PROTOTYPE CONVERTER-MOSC SENSORS FOR THIS ROLE, MAKING THEM AVAILABLE FOR PHASE III REPLICATION AND FOR SYSTEM DEPLOYMENT. THE PHASE I EFFORT WILL CONTRIBUTE BY THE DEVELOPMENT OF A VALIDATED SENSOR PERFORMANCE SIMULATION AND DESIGN BASE, BY DEFINITION OF THE EXISTING OR EXTRAPOLABLE FABRICATION TECHNOLOGY REQUIRED FOR PROTOTYPE SENSOR CONSTRUCTION, AND BY COST ANALYSIS OF PHASE II FABRICATION TECHNOLOGY DEVELOPMENT AND OF PHASE III REPLICATION.

ADVANCED RESEARCH & APPLICATIONS CORP 1223 E ARQUES AVE SUNNYVALE, CA 94086 J H STANLEY	SDIO	\$ 75,129
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## TITLE:

DETECTION OF FLAWS IN ELECTRONIC METALLURGICAL BONDS

T 11 OFFICE:

METALLURGICAL BONDS ARE REQUIRED AT SEVERAL POINTS IN THE MANUFACTURE



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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OF COMPLEX ELECTRONIC DEVICES. WHILE THE RAPID AND ACCURATE INSPECTION OF THE BONDS HAS ALWAYS BEEN A DIFFICULT PROBLEM, THE DRAMATIC INCREASE IN THE USE OF TAPE-AUTOMATED BONDING TO FORM CHIP-TO-PACKAGE BONDS AND SURFACE MOUNTED TECHNOLOGY TO FORM PACKAGE-TO-PC BOARD CONNECTIONS HAVE RESULTED IN EVEN MORE DIFFICULT INSPECTION REQUIREMENTS WHICH CANNOT BE MET BY EXISTING INSPECTION TECHNOLOGY. ELECTRONIC FAILURES IN MILITARY SYSTEMS CAN BE CRITICAL. THE SOLDER BONDS OF SURFACE MOUNTED COMPONENTS MUST PROVIDE THE PRIMARY STRUCTURAL, AS WELL AS ELECTRICAL, CONNECTION IN APPLICATIONS THAT MAY INCLUDE HOSTILE THERMAL CONDITIONS, MECHANICAL STRESSES FROM VIBRATION AND SHOCK AND RADIATION EFFECTS. AN ADVANCED X-RAY-BASED INSPECTION TECHNIQUE IS PROPOSED THAT WOULD PROVIDE A RAPID AND ACCURATE INSPECTION OF CHIP-TO-PACKAGE BONDS AND SOLDER BONDS ON PC BOARDS.

ADVANCED RESEARCH & APPLICATIONS CORP	SDIO	\$ 80,523
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1223 E ARQUES AVE  
SUNNYVALE, CA 94086  
JAMES J LEPAGE

## TITLE:

DYNAMIC COMPUTED TOMOGRAPHY DIAGNOSTIC DEVELOPMENT FOR THE  
LETHALITY AND TARGET HARDENING PROGRAMS

T 8 OFFICE:

THE DEVELOPMENT OF AN INNOVATIVE DIAGNOSTIC CAPABILITY FOR SDI LETHALITY AND TARGET HARDENING (LTH) MATERIALS RESPONSE EXPERIMENTAL RESEARCH IS PROPOSED. THE NEW CAPABILITY WILL ALLOW IN-PROCESS VISUALIZATION OF SHOCK-INDUCED DAMAGE NUCLEATION AND GROWTH. THE BASIS FOR THE DIAGNOSTIC TECHNIQUE IS THE ADAPTATION OF X-RAY TRANSMISSION COMPUTED TOMOGRAPHY (CT) TO THE SIMULTANEOUS COLLECTION OF MULTIPLE-VIEW DATA. TO DEMONSTRATE THE FEASIBILITY OF THE APPROACH, THE PHASE I PROJECT WILL USE CT SIMULATION COMPUTER CODES TO DEFINE THE PERFORMANCE CHARACTERISTICS OF A LIMITED-VIEW, SIMULTANEOUS-VIEW CT SYSTEM BASED ON PARALLEL FLASH X-RAY SOURCES AND SPATIALLY-RESOLVING ELECTRO-OPTIC DETECTORS. RECONSTRUCTION ALGORITHMS COMMENSURATE WITH THE APPLICATION WILL BE DEVELOPED, AND THE AVAILABLE SOURCE/DETECTOR ARRAY HARDWARE TECHNOLOGY WILL BE DEFINED.

ADVANCED RESOURCE DEVELOPMENT CORP	ARMY	\$ 49,993
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5457 TWIN KNOLL RD  
COLUMBIA, MD 21045  
DR RICHARD L HORST

## TITLE:

INDIVIDUALIZED MEASURES OF PILOT WORKLOAD FOR COCKPIT TEST AND  
EVALUATION

T 179 OFFICE: TECOM/AVDTA

IT IS WELL-RECOGNIZED THAT THERE ARE INDIVIDUAL DIFFERENCES IN THE

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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WAY PEOPLE PERCEIVE WORKLOAD AND IN THE EFFECTIVENESS WITH WHICH THEY CAN DEAL WITH INCREASES IN TASK DEMANDS. FOR SOME PEOPLE, PERFORMANCE DETERIORATES AS TASK DEMANDS INCREASE. OTHER PEOPLE ARE ABLE TO COMPENSATE FOR INCREASED TASK DEMANDS BY PUTTING FORTH MORE EFFORT. SUCH INDIVIDUAL DIFFERENCES WILL CONFOUND THE QUANTIFICATION OF WORKLOAD FOR MAKING T&E DESIGN DECISIONS. THE PRESENT WORK EVALUATES TWO SUBJECTIVE RATING SCALES THAT OFFER INDIVIDUALIZED WORKLOAD METRICS -- THE SUBJECTIVE WORKLOAD ASSESSMENT TECHNIQUE AND THE WEIGHTED BIPOLAR RATING TECHNIQUE. THE SENSITIVITY OF THESE TECHNIQUES WILL BE EVALUATED AS TASK DEMANDS ARE MANIPULATED IN A DUAL-TASK TRACKING PARADIGM. WORKLOAD METRICS BASED ON SUBJECTIVE RATINGS WILL BE VALIDATED AGAINST THOSE BASED ON BEHAVIORAL AND PSYCHO-PHYSIOLOGICAL MEASURES.

ADVANCED ROTORCRAFT TECHNOLOGY INC 1804 STIERLIN RD - STE 210 MOUNTAIN VIEW, CA 94043 DR RONALD W DU VAL TITLE: A REAL-TIME BLADE ELEMENT ROTORCRAFT SIMULATION DEVELOPMENT	ARMY	\$ 49,613
T 42 OFFICE: AVSCOM/AMSAV		

THE COMPUTATIONALLY INTENSE NATURE OF BLADE ELEMENT ROTORCRAFT MATH MODELS HAS LIMITED THEIR USE IN REAL-TIME SIMULATIONS TO LARGE MAINFRAME COMPUTERS OR SPECIAL PURPOSE COMPUTER SYSTEMS. BLADE ELEMENT MODELS ARE, HOWEVER, NECESSARY TO ACCURATELY REPRODUCE THE ROTORCRAFT RESPONSE DURING COMPLEX MANUEVERS, SUCH AS THOSE REQUIRED FOR COMBAT. THE RECENTLY RELEASED DEC MICROVAX II COMPUTER HAS THE CAPABILITY TO SUPPORT MULTIPLE CPU'S, MAKING IT A VERY COST EFFECTIVE CANDIDATE FOR REAL-TIME IMPLEMENTATION OF A ROTORCRAFT BLADE ELEMENT SIMULATION. ADVANCED ROTORCRAFT TECHNOLOGY, INC. (ART) PROPOSES TO DEVELOP A REAL-TIME BLADE ELEMENT ROTORCRAFT SIMULATION BASED ON A PARALLEL PROCESSING MICROVAX II COMPUTER SYSTEM. THE SIMULATION WILL UTILIZE AN EXISTING BLADE ELEMENT MATH MODEL OF THE UH-60 BLACK HAWK HELICOPTER. THIS PRODUCT MAY BE INTERFACED TO EXISTING SIMULATION CREW STATION, VISUAL SYSTEMS, AND MOTION BASE DRIVES, OR BE DIRECTLY CONNECTED TO THE DISPLAYS AND CONTROLS OF AN ACTUAL ROTORCRAFT WITH DIGITAL INTERFACE CAPABILITY. KEY FEATURES OF THE PROPOSED PRODUCT INCLUDE: A NEW APPROACH TO PARALLEL DISTRIBUTION OF THE MAIN ROTOR COMPUTATION THAT MINIMIZES THE NUMBER OF PARALLEL CPU'S REQUIRED FOR REAL-TIME OPERATION; A LOW COST, GENERAL PURPOSE VAX COMPUTER SYSTEM

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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THAT COULD ALSO BE USED TO SUPPORT OTHER APPLICATIONS; AND THE USE OF EXISTING BLADE ELEMENT ROTORCRAFT SIMULATION SOFTWARE WITH A MINIMUM OF MODIFICATION.

ADVANCED TECHNOLOGIES & TESTING LABS INC 2109 KYLEMORE DR GREENSBORO, NC 27406 D Y GOSWAMI TITLE: RADIATIVE AND CONVECTIVE HEAT TRANSFER OVER ABLATING COMPOSITE FLAT SURFACE IN HYPERSONIC FLOW REGIME T 1 OFFICE: AFOSR/XOT	AF	\$ 38,848
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IN HYPERSONIC CRUISE, THE OUTER SURFACE OF A VEHICLE MADE OF A COMPOSITE MATERIAL ABLATES. THE ABLATED PARTICLES PENETRATE INTO THE BOUNDARY LAYER AFFECTING THE FLOW DYNAMICS AS WELL AS RADIATIVE AND CONVECTIVE HEAT TRANSFER TO AND FROM THE VEHICLE. THE AUTHORS PROPOSE TO PERFORM THEORETICAL ANALYSIS OF RADIATIVE AND CONVECTIVE HEAT TRANSFER IN A TURBULENT BOUNDARY LAYER OF HEAT RADIATION SCATTERING AND ABSORBING MEDIUM OVER AN ABLATING FLAT PLATE. IN ADDITION TO DESCRIBING THE PHYSICAL PHENOMENA MORE ACCURATELY, THE PROPOSED STUDY IS RELEVANT TO MODELING THE ABOVE-DESCRIBED HEAT TRANSFER PHENOMENON FOR UTILIZATION OF RADIATION AS A STRUCTURAL COOLING TECHNIQUE AND INVESTIGATION OF PROTECTIVE OF THE ABLATED SHEATH IN CASE OF A STRONG INCIDENT RADIATION CAUSED BY A NEARBY NUCLEAR BLAST.

ADVANCED TECHNOLOGY & RESEARCH INC 3933 SANDY SPRING RD BURTONSVILLE, MD 20866 DR HYMAN STERNBERG TITLE: EQUATION OF STATE AND UNDERWATER DETONATION OF COMPOSITE EXPLOSIVES T 126 OFFICE: NSWC/NAVSEA	NAVY	\$ 50,000
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THE OBJECTIVES OF THIS WORK ARE TO DEVELOP THE PRESSURE AND USEABLE ENERGY CHARACTERISTICS FOR FOUR (4) IMPORTANT EXPLOSIVES. THE EXPLOSIVES ARE PBX-113, PBX-114, PBX-115, AND PBX-9404. THESE ANALYSES WILL ADDRESS THE CLOSE-IN REGIME UP TO ABOUT 10 CHARGE RADII FROM THE EXPLOSIVE. THE PRESSURE TIME HISTORY AT FIXED STATIONS IN THE CALCULATIONS WILL ALSO BE MADE. THE EQUATION OF STATE FOR THE EX-

FISCAL YEAR 1986

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EXPLOSIVES UNDER CONSIDERATION WILL BE GENERATED. THE FORM OF THE EQUATIONS OF STATE WILL BE THE JWL FORM. IF NECESSARY, ENERGY WILL BE ADDED AT LATE TIMES, TO SIMULATE ADDITIONAL REACTION. COMPUTATIONS FOR 1 TO 1 CYLINDERS WILL BE MADE WITH THE SPIDER CODE FOR EACH EXPLOSIVE. EXPLANATIONS FOR WHY CERTAIN EXPLOSIVES ARE BETTER THAN OTHERS WILL BE PROVIDED.

AERODYNE PRODUCTS CORP 45 MANNING RD BILLERICA, MA 01821 DR MORTON CAMAC TITLE: PORTABLE FUEL LEAK DETECTOR BASED ON SPECTRAL CORRELATION TECHNIQUES DEVELOPMENT T 184 OFFICE: AFWAL/PO	AF	\$ 49,988
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THE DEVELOPMENT OF A DEVICE BASED ON THE SPECTRAL CORRELATION TECHNIQUE IS PROPOSED. THE SMALL, HAND-HELD DEVICE WILL DETECT FUEL VAPOR IN CONCENTRATIONS AS LOW AS 1 ppm BASED ON THE INFRARED ABSORPTION CHARACTERISTICS OF THE FUEL VAPOR. THE SPECTRAL CORRELATION TECHNIQUE ALLOWS THE DEVICE TO ACCURATELY MEASURE FUEL VAPOR CONCENTRATIONS IN THE ppm RANGE IN THE PRESENCE OF OTHER IR ABSORBING SPECIES. THE TECHNIQUE ALSO REDUCES THE NEED FOR VERY STRICT REGULATION OF THE IR SOURCE INTENSITY, THUS REDUCING THE COST AND COMPLEXITY OF THE DEVICE. STATIONARY FUEL VAPOR MONITORS OF HIGHER SENSITIVITY CAN ALSO BE DEVELOPED USING THE SPECTRAL CORRELATION TECHNIQUE. A COMBINATION OF STATIONARY AND PORTABLE MONITORS WILL ALLOW FUEL LEAKS TO BE DETECTED AND THE EXACT LOCATION IDENTIFIED.

AERODYNE PRODUCTS CORP 45 MANNING RD BILLERICA, MA 01821 MORTON CAMAC TITLE: MOSAIC INFRARED SCENE SIMULATOR T 291 OFFICE: AEDC/DOT	AF	\$ 49,101
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A MOSAIC INFRARED SCENE SIMULATOR (MISS) PROVIDES A SIMULATION WITH 10 TO THE 6TH POWER OR MORE INDIVIDUALLY SETABLE PIXELS. THE MISS USES A MICROLITHOGRAPHIC PROCESS TO GENERATE A MOSAIC OF INDIVIDUAL

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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DIFFRACTION GRATINGS WITH THE DIFFRACTION EFFICIENCY OF EACH PIXEL BEING SET IN THE GRATING GENERATION PROCESS. BECAUSE THE SCENE IS A DIFFRACTION GRATING, OVERCOATED WITH A HIGHLY REFLECTIVE METALIZATION, SELF EMISSION IS LOW AND THE SENSOR UNDER TEST OBSERVES ONLY THE BLACK BODY RADIATION DIFFRACTED BY THE GRATING. MOVING TARGETS CAN BE ADDED, AS WELL AS SIMULATIONS OF ATMOSPHERIC ABSORPTION. FOR CHANGING SCENES, TWO SETS OF SCENES CAN BE USED WITH ONE IN VIEW WHILE THE SECOND MOVES TO A NEW SCENE. THE SENSOR WOULD ALWAYS HAVE ONE SCENE PRESENT AS THE SECOND IS REPLACED. DUPLICATE SCENES CAN BE PRODUCED BY ECONOMICAL MASS REPLICATION TECHNIQUES.

AERODYNE PRODUCTS CORP 45 MANNING RD BILLERICA, MA 01821 E S GAYNOR TITLE: PHOTOPOLYMER HOLOGRAPHIC OPTICAL ELEMENTS (HOES) T 68 OFFICE: CECOM/AMSEL	ARMY	\$ 49,876
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SURVIVAL IN NEAR-FUTURE BATTLEFIELD SCENARIOS MAY DEPEND UPON THE USE OF HOLOGRAPHIC OPTICAL ELEMENTS (HOES) WHOSE UNIQUE FUNCTIONS SERVE: TO PROTECT PERSONNEL FROM EYE-DAMAGING RADIATION, TO SIMPLIFY AIR-CRAFT PILOT VISUAL FUNCTION, AND TO PROVIDE VASTLY IMPROVED COMMUNICATIONS AND SIGNAL PROCESSING SYSTEMS. THESE AND MANY OTHER COMPELLING CAPABILITIES OF HOES CAN ONLY BE EXPLOITED IF THEY CAN BE PRODUCED TO HIGH QUALITY STANDARDS AND INTEGRATED INTO MILITARY SYSTEMS IN A COST-EFFECTIVE MANNER. IN THE PROPOSED PROGRAM, AERODYNE PRODUCTS CORPORATION (APC) WILL RECORD, TEST, AND EVALUATE HOES USING PROMISING PHOTOPOLYMER MATERIALS. EMPHASIS IN PHASE I WILL BE ON DETERMINING THE FEASIBILITY OF PHOTOPOLYMER - HOES FOR BATTLEFIELD USE BY TESTING THEM UNDER VARIOUS ENVIRONMENTAL CONDITIONS PRESCRIBED BY MILITARY SPECIFICATIONS. ALSO, FURTHER CHARACTERIZATION OF THE MATERIALS' OPTICAL PROPERTIES WILL RESULT IN IMPROVED CONFIDENCE IN COST-EFFECTIVENESS PROJECTIONS.

AERODYNE RESEARCH INC 45 MANNING RD BILLERICA, MA 01821 DR JOHN H GRUNINGER TITLE: INFRARED TARGET MODELING FOR IMAGE UNDERSTANDING APPLICATIONS T 112 OFFICE: AFWAL/AA	AF	\$ 49,990
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WE PROPOSE TO DEVELOP THE TOOLS FOR THE DETERMINATION AND EVALUATION

FISCAL YEAR 1986

SUBMITTED BY  
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OF KNOWLEDGE BASES FOR INFRARED IMAGE INTERPRETATION SYSTEMS. OUR APPROACH IS BASED ON A THREE DIMENSIONAL MODELING SYSTEM WHICH WILL CONTAIN PHENOMENOLOGY FROM WHICH IMAGES CAN BE SYNTHESIZED. THE THREE DIMENSIONAL MODEL WILL BE DEVELOPED TO THE LEVEL OF DETAIL WHICH IS CONSISTENT WITH THE SPATIAL AND THERMAL RESOLUTIONS OF THE OUTPUT IMAGES THAT ARE REQUIRED BY THE INTERPRETATION SYSTEM. THE MODEL DEVELOPMENT AT THE APPROPRIATE LEVEL OF DETAIL WILL FACILITATE RAPID IMAGE GENERATION. THE 3-D MODELS AND IR PHENOMENOLOGY CAN BE VALIDATED AND CALIBRATED AGAINST REAL FIELD IMAGES, THEN USED TO GENERATE DATA BASES OF IMAGES TO TEST HYPOTHESIS ON INTERPRETATION RULES IN ALL CONTEXTS AT ANY ASPECT OR RANGE. THE GENERATION SYSTEM WILL BE ABLE TO GENERATE BOTH LEARNING SETS TO AID IN RULE DETERMINATION AND TEST SETS TO TEST RULES FOR THEIR CONSISTENCY AGAINST A VARIETY OF CONTEXTS AT VARIOUS RESOLUTIONS.

AERODYNE RESEARCH INC

AF

\$ 49,944

45 MANNING RD

BILLERICA, MA 01821

DR ANDREW FREEDMAN

TITLE:

III-V COMPOUNDS TRACE ELEMENT PROFILE ANALYSIS USING LASER ASSISTED SPECTROSCOPY

T 55

OFFICE: RADC/DOR

A NOVEL MICROPROBE ANALYSIS TECHNIQUE WHICH HAS THE POTENTIAL FOR EXTREMELY SENSITIVE QUANTATIVE MEASUREMENTS OF SURFACE AND BULK CONCENTRATIONS AS WELL AS DEPTH PROFILES IS PROPOSED. THIS TECHNIQUE USES TWO PULSED LASERS TO VAPORIZE AND PROBE THE SURFACE LAYERS AND IS THUS CALLED PROFILE ANALYSIS BY LASER ASSISTED SPECTROSCOPY (PALAS). THIS PHASE I PROJECT WILL DEMONSTRATE THE FEASIBILITY OF PALAS BY MAKING MEASUREMENTS OF IMPURITY AND DOPANT CONCENTRATIONS IN GaAs AND InP. THESE MEASUREMENTS WILL BE PERFORMED IN SUCH A MANNER AS TO DEMONSTRATE THE UTILITY OF THE TECHNIQUE AS IN SITU DIAGNOSTIC FOR CONDITIONS GENERALLY ENCOUNTERED IN METALORGANIC CHEMICAL VAPOR DEPOSITION (MOCVD). EXTENSIONS OF THE TECHNIQUE TO HIGH AND ULTRAHIGH VACUUM CONDITIONS ENCOUNTERED IN MOLECULAR BEAM EPITAXY (MBE) AND COMPLEMENTARY SURFACE DIAGNOSTIC TECHNIQUES ARE ALSO POSSIBLE.

AERODYNE RESEARCH INC

AF

\$ 68,995

45 MANNING RD

BILLERICA, MA 01821

DR CHARLES E KOLB

TITLE:

A BORON ASSISTED COMBUSTION MODEL WITH SENSITIVITY ANALYSIS DEVELOPMENT

T 4

OFFICE: AFOSR/XOT

SOLID BORON HAS LONG BEEN RECOGNIZED AS A POTENTIAL HIGH VOLUMETRIC

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>DENSITY PROPELLANT FOR VOLUME LIMITED ROCKET AND AIR BREATHING PROPULSION SYSTEMS. HOWEVER, ACHIEVING THIS POTENTIAL HAS BEEN DIFFICULT DUE TO LOW COMBUSTION AND HEAT RELEASE EFFICIENCIES IN CONVENTIONALLY DESIGNED COMBUSTORS. A THREE PHASE MODEL OF BORON ASSISTED COMBUSTION IS POSTULATED AND THE ROLE THAT KINETIC SENSITIVITY ANALYSIS CAN PLAY IN ELUCIDATING CRITICAL MODEL REACTIONS AND PROCESSES IS EXAMINED. A PHASE I PROPOSAL TO IMPLEMENT A BORON ASSISTED HOMOGENEOUS COMBUSTION PHASE MODEL IS PRESENTED. PHASE II EFFORTS WOULD EXTEND THIS COMBUSTION MODEL AND THE NECESSARY SENSITIVITY ANALYSIS CONCEPTS TO THE HETEROGENEOUS COMBUSTION PHASES OF IGNITION AND EXHAUST CONDENSATION.</p>		

AERODYNE RESEARCH INC 45 MANNING RD BILLERICA, MA 01821 DR ANDREW FREEDMAN TITLE: HYPERVELOCITY OXYGEN SOURCE FOR THE STUDY OF ATOM-SURFACE INTERACTIONS T 4 OFFICE: AFOSR/XOT	AF	\$ 49,910
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SPACE-BASED FACILITIES FACE AN UNEXPECTEDLY HOSTILE ENVIRONMENT AT ORBITAL ALTITUDES DUE TO CHEMICAL INTERACTIONS WITH ATOMIC OXYGEN AT THE HIGH VELOCITIES OF ORBITING SPACECRAFT. DEGRADATION AND EROSION OF MATERIALS FACING INTO THE ATMOSPHERIC WIND POSE A THREAT TO THE EFFECTIVE LIFE AND UTILITY OF SATELLITES, SPACE STATION SYSTEMS, AND ESPECIALLY SPACE-BASED OPTICAL INSTRUMENTATION. WE PROPOSE TO STUDY THE FEASIBILITY OF CONSTRUCTING A GROUND-BASED FACILITY TO STUDY OXYGEN-ATOM BOMBARDMENT OF SPACE MATERIALS UNDER SIMULATED SPACE CONDITIONS. THIS FACILITY WOULD INCORPORATE AN ELECTRIC DISCHARGE HEATED HYPERTHERMAL ATOMIC OXYGEN BEAM SOURCE, "ZONE OF SILENCE" SKIMMING TECHNIQUES, AND STATE-OF-THE-ART DIAGNOSTIC TOOLS. THE GOAL OF SUCH STUDIES WOULD BE TO PROVIDE A BASIC UNDERSTANDING OF ATOM-SURFACE CHEMISTRY.

AERODYNE RESEARCH INC 45 MANNING RD BILLERICA, MA 01821 DR CHARTER STINESPRING TITLE: LASER-INDUCED SURFACE CHEMICAL EPITAXY: A NOVEL THIN FILM DEPOSITION TECHNIQUE T 7 OFFICE: AFOSR/XOT	AF	\$ 50,000
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THIS PROPOSAL IDENTIFIED A NEW TYPE OF LASER-INDUCED EPITAXIAL

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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GROWTH PROCESS TERMED LASER-INDUCED SURFACE CHEMICAL EPITAXY (LSCE), AND ADDRESSES KEY ISSUES RELATING TO THE FEASIBILITY OF THE TECHNIQUES. THE POTENTIAL ADVANTAGES OF LSCE INCLUDE LAYER-BY-LAYER CONTROL OVER STOICHIOMETRY, ABRUPT INTERFACES, AND LOW GROWTH TEMPERATURES. ADDITIONALLY, LSCE MAY BE USED TO DEPOSIT A WIDE VARIETY OF MATERIALS INCLUDING METALS, METAL OXIDES, SULFIDES, AND PHOSPHIDES, AND II-VI AND III-V COMPOUNDS. THESE ADVANTAGES MAKE THE LSCE TECHNIQUE PARTICULARLY WELL SUITED TO THE DEPOSITION OF QUANTUM WELL AND SUPERLATTICE MATERIALS AND DEVICE STRUCTURES WHICH WILL PLAY AN INCREASINGLY IMPORTANT ROLE IN MICROELECTRONICS AND ELECTRO-OPTICS TECHNOLOGY.

AEROMET INC PO BOX 701767 TULSA, OK 74170 D RAY BOOKER TITLE: A REAL-TIME 3-D CLOUD SIMULATION SYSTEM DEVELOPMENT T 195 OFFICE: BMO/MYSC	AF	\$ 49,946
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THIS PROPOSAL DESCRIBES A FEASIBILITY STUDY FOR IMPLEMENTING A REAL-TIME, THREE-DIMENSIONAL CLOUD MODEL TO SUPPORT REENTRY VEHICLE TEST OPERATIONS. AN EXISTING RESEARCH CLOUD MODEL WOULD BE INTERFACED TO A MESOSCALE ATMOSPHERIC MODEL. THE COMBINED MODELING SYSTEM WOULD BE ADAPTED FOR USE AT THE KWAJALEIN MISSILE RANGE (KMR). FORECASTS OF DETAILED CLOUD FEATURES SUCH AS WATER CONTENT, RADAR REFLECTIVITY AND HYDROMETEOR SIZE DISTRIBUTIONS WOULD BE GENERATED WITH 1 KM RESOLUTION FOR TIMES OUT TO FOUR HOURS. THE NEED FOR DETAILED CLOUD FORECASTS IS DISCUSSED. A BRIEF REVIEW OF MATHEMATICAL ATMOSPHERIC MODELS IS PRESENTED AND A MODEL HIERARCHY FOR IMPLEMENTING CIRRUS CLOUD FORECASTS AT KMR IS PROPOSED. THE SUITABILITY OF THE TROPICAL ATMOSPHERE, AND KMR IN PARTICULAR, AS A SITE FOR OPERATIONAL CLOUD MODELING IS EXPLAINED.

AEROSTRUCTURES INC 1225 JEFFERSON DAVIS HWY - STE 512 ARLINGTON, VA 22202 DR V ELCHURI TITLE: CORRELATION OF FLIGHT PURPOSE CODES WITH FLIGHT MANEUVERS DATA FOR IMPROVED FATIGUE ESTIMATES IN SAFE PROGRAM T 84 OFFICE: NAVAIR	NAVY	\$ 49,917
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FATIGUE LIFE EXPENDITURE DETERMINATIONS UNDER THE SAFE PROGRAM DO NOT



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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ACCOUNT FOR FLIGHT VARIATIONS FOR DIFFERENT MISSIONS, OR EMPLOY STATE-OF-THE-ART SEQUENCE-ACCOUNTABLE FATIGUE ANALYSES. THE PROPOSED PROGRAM WILL INVESTIGATE THE FEASIBILITY OF UTILIZING THE FLIGHT PURPOSE CODE DATA TO DEVELOP CORRELATIONS BETWEEN FLIGHT PURPOSE CODES, GROSS WEIGHTS, AND FLIGHT MANEUVERS SPECTRA; AND ESTABLISH ACTUAL LOADING HISTORIES. CORRELATIONS WILL BE ESTABLISHED UTILIZING ROUTINELY DOCUMENTED DATA FROM COUNTING ACCELEROMETER RECORDS, 3M FLIGHT RECORDS (YELLOW SHEET), AIRCRAFT/SQUADRON LOG BOOK RECORDS AND FROM FLEET FLIGHT LOAD SURVEY DATA. SUBSTANTIATION OF THE VALIDITY OF DERIVED CORRELATIONS WILL BE DEMONSTRATED FOR A SELECTED TACTICAL AIRCRAFT.

AKM ASSOCS 30 WEST POINT PL SAN MATEO, CA 94402 DR ASOK K MUKHOPADHYAY	SDIO	\$ 50,000
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## TITLE:

ADAPTIVE ELECTRO-OPTICAL SIGNAL PROCESSOR (AEOP) FOR SDIO APPLICATIONS

T 3 OFFICE:

FOR THE REALIZATION OF AN EFFECTIVE STRATEGIC DEFENSE SYSTEM, IT IS NECESSARY TO SENSE AND TRACK EXTREMELY DIM, DISTANT SPACE OBJECTS AND TO DEVISE METHODS FOR DISTINGUISHING ARMED REENTRY VEHICLES (RVS) FROM DECOYS DURING THE EARLIEST POSSIBLE PHASES OF DEPLOYMENT. THE NAME FOR THE SIGNAL PROCESSOR CONCEPT BEING DEVELOPED AT AKM ASSOCIATES IS AEOP (ADAPTIVE ELECTRO-OPTICAL PROCESSOR). THE PROCESSOR PROVIDES FLEXIBILITY IN ITS HARDWARE CONFIGURATION AND ALGORITHMS AND, THEREFORE, CAN BE ADAPTED TO SUPPORT A WIDE VARIETY OF SENSOR SYSTEMS. THE AEOP CONCEPT DEVELOPMENT CAN BE BROKEN DOWN INTO TWO MAJOR PARTS: THE FIRST IS THE CONCEPTUAL DESIGN OF A LIBRARY OF PROGRAMMABLE AND INTERFACEABLE MODULES THAT CAN BE PLUGGED TOGETHER IN VARIOUS ORDERS TO REALIZE DIFFERENT SIGNAL PROCESSOR CONFIGURATIONS; IN PHASE II OF THIS PROPOSED EFFORT, RATHER THAN PROVIDING FOR A DEDICATED, SINGLE-MISSION, INFLEXIBLE HARDWARE DESIGN, PROGRAMMABLE BUILDING BLOCKS OF THE AEOP WILL BE DEVELOPED AND DEMONSTRATED. ANY OF THE LARGE CLASS OF SIGNAL PROCESSORS FOR SDI APPLICATIONS CAN BE EVENTUALLY BUILT FROM THESE FUNDAMENTAL ELEMENTS. TO PERFORM THE AEOP DESIGN ANALYSIS IN PHASE I OF THIS RESEARCH PROPOSAL, APPROPRIATE COMPUTER SIMULATIONS WILL BE DEVELOPED AND EXERCISED ON AKM ASSOCIATES MICRO VAX II COMPUTER SYSTEM WITH THE MICRO VMS OPERATING

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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SYSTEM. THUS, THE DEVELOPED ALGORITHMS WILL BE INSTANTLY PORTABLE TO ANY DOD FACILITY WITH THE VAX/VMS FAMILY OF COMPUTERS.

AKM ASSOCS 30 WEST POINT PL SAN MATEO, CA 94402 DR A K MUKHOPADHYAY TITLE: MODEL-BASED MACHINE VISION ALGORITHM FOR BATTLEFIELD TARGET IDENTIFICATION T 29	ARMY	\$ 49,972
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OFFICE: ARDC/SMCAR

THERE IS A NEED TO DEVELOP FAST, ('REAL-TIME'), THREE DIMENSIONAL (3D) VISION PROCESSING ALGORITHMS APPLICABLE TO MACHINE RECOGNITION OF PATTERNS IN SUPPORT OF FIRE CONTROL SUB-SYSTEMS, CAPABLE OF AUTOMATICALLY RECOGNIZING TARGETS ON THE BATTLEFIELD. TARGET IDENTIFICATION WHICH INVOLVES COMPLEX HUMAN DECISION MAKING IS NOT VERY RELIABLE UNDER THE STRESS OF COMBAT ENGAGEMENT, EVEN THOUGH A DISTINCT AND UNAMBIGUOUS TARGET IMAGE IS AVAILABLE. IN MANY PRACTICAL APPLICATIONS OF AUTOMATED VISION, THE EXACT SHAPE OF THE OBJECT TO BE RECOGNIZED IS KNOWN IN ADVANCE. FOR THE U.S. ARMY, IN MOST INSTANCES, THE BATTLEFIELD TARGETS TO BE RECOGNIZED WILL BE COMBAT AND TRANSPORT VEHICLES, MISSILE AND GUN CARRIERS, AND INFANTRY SUPPORT HELICOPTERS AND AIRCRAFT. IN THIS KIND OF SITUATION, IT IS DESIRABLE AND POSSIBLE TO SPLIT THE COMPUTATION INTO TWO STATES: A MODEL-BUILDING STAGE IN WHICH USEFUL INFORMATION ABOUT THE UNCHANGING TARGET CHARACTERISTICS IS COMPILED, AND AN EXECUTION STAGE IN WHICH THIS INFORMATION IS EXPLOITED FOR THE RAPID RECOGNITION OF TARGETS OF INTEREST IN THE IMAGE. THE RESULT OF OUR PROPOSED RESEARCH WILL BE A FAST, MACHINE-VISION PROGRAM FOR RECOGNIZING AND LOCATING BATTLEFIELD TARGETS IN IMAGES WITHOUT RESTRICTION ON THE ORIENTATION OF THE TARGETS IN SPACE. SUCH AN ARTIFICIAL INTELLIGENCE (AI)-BASED PROGRAM WITH A HEURISTIC DATABASE WILL BE DEVELOPED ON A 32-BIT MICROPROCESSOR (E.G., MICROVAX II) AND WOULD EVENTUALLY RESIDE INSIDE A COMBAT OR VERY INTELLIGENT SURVEILLANCE AND TARGET ACQUISITION (VISTA) VEHICLE.

AKM ASSOCS 30 WEST POINT PL SAN MATEO, CA 94402 DR ASOK K MUKHOPADHYAY TITLE: KNOWLEDGE-BASED INTELLIGENT TRACKER (KBIT) AS FIRE CONTROL AID T 28	ARMY	\$ 49,972
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OFFICE: ARDC/SMCAR

A NEED EXISTS FOR THE DEVELOPMENT OF A KNOWLEDGE-BASED INTELLIGENT

FISCAL YEAR 1986

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TRACKER (KBIT) ALGORITHM WITH A HEURISTIC DATA BASE WHICH WOULD BE RESIDENT ON A FUTURE COMBAT VEHICLE. ITS PURPOSE WILL BE TO AUTOMATICALLY DETECT AND TRACK MULTIPLE TARGETS SIMULTANEOUSLY. CURRENTLY, THE RDC ROBOTICS AND AUTOMATION LABORATORY HAS A NORTHRUP VIDEO AUTOMATIC TARGET TRACKER (VATT) HARDWARE/SOFTWARE WHICH OPERATES IN A STANDALONE MODE. J FOR THAT REASON, VATT SUFFERS FROM THE DEFICIENCIES OF A CONVENTIONAL VIDEO TRACKER, VIZ., 'AIM-POINT-WANDER', FAILURE TO CONTROL TRACK WINDOW SIZE (POOR 'GATE-DICIPLINE'), LOSS OF TRACK AND FALSE TARGET LOCK-ON IN HIGH CLUTTER AND/OR LOW TARGET-TO-BACKGROUND CONTRAST ENVIRONMENT. HENCE, AKM ASSOCIATES PROPOSES TO LINK THE OPERATION OF THE EXISTING TRACKER TO THAT OF THE AUTOMATIC TARGET RECOGNITION (ATR) MODULE DEVELOPED FOR ARDC BY AKM ASSOCIATES UNDER A 1984, PHASE I SBIR AWARD. THESE TWO AI-BASED FIRE CONTROL DECISION AIDS ACTING SYNERGISTICALLY WOULD UTILIZE TO THE FULLEST EXTENT ARDC PROGRAMS AND EXISTING HARDWARE AND WOULD BE OF GREAT SIGNIFICANCE WITHIN THE ADOPTED FINITE-STATE-MACHINE (FSM) STRUCTURE FOR THE WEAPON PLATFORM AUTOMATION. THE KBIT ALGORITHM WILL BE DEVELOPED ON THE AKM ASSOCIATES MICROVAX II AI WORKSTATION WITH MICROVMS 3 OPERATING SYSTEM AND USING THE VAXLISP LANGUAGE. SUCH AN IMPLEMENTATION WILL BE COMPLETELY PORTABLE TO ARDC VAX 11/780 COMPUTER SYSTEM.

ALABAMA CRYOGENIC ENGINEERING INC

SDIO

\$ 49,959

PO BOX 2451

HUNTSVILLE, AL 35804

DR JOHN B HENDRICKS

TITLE:

CRYOCOOLER FOR HIGH ACCELERATION SYSTEMS

T 2 OFFICE:

A CRYOCOOLER CAPABLE OF OPERATING UNDER EXTREMELY HIGH ACCELERATION LEVELS IS PROPOSED. THE CRYOCOOLER USES THE LINDE-HAMPSON CYCLE, AND CAN REACH APPROXIMATELY 80 KELVIN. MULTI-STAGE UNITS, TO REACH LOWER TEMPERATURES, ARE ALSO POSSIBLE.

ALABAMA CRYOGENIC ENGINEERING INC

SDIO

\$ 49,931

PO BOX 2451

HUNTSVILLE, AL 35804

DR JOHN B HENDRICKS

TITLE:

CRYOCOOLER FOR EXTENDING THE STORAGE TIME OF CRYOGENS IN SPACE

T 6 OFFICE:

THIS PROPOSAL COVERS THE DEVELOPMENT OF A CRYOCOOLER FOR COOLING A

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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LIQUID CRYOGEN STORAGE DEWAR TO IMPROVE THE STORAGE TIME IN SPACE. AS A BASELINE, A TWO STAGE SYSTEM OPERATING AT 80 KELVIN AND 20 KELVIN IS CHOSEN. THE COOLING CAPACITIES OF THE TWO STAGES ARE SET TO CORRESPOND TO A TYPICAL STORAGE DEWAR SYSTEM. THE CRYOCOOLER SHOULD BE CAPABLE OF VERY LONG LIFETIME BECAUSE IT HAS NO MOVING PARTS AT CRYOGENIC TEMPERATURES.

ALABAMA CRYOGENIC ENGINEERING INC PO BOX 2451 HUNTSVILLE, AL 35804 JOHN B HENDRICKS TITLE: A COMPACT LINDE-HAMPSON CRYOCOOLER FOR 20K OPERATION T 131 OFFICE: NWC/NAVAIR	NAVY	\$ 49,224
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THIS PROPOSAL COVERS THE DEVELOPMENT OF A CRYOCOOLER WITH A REFRIGERATION CAPACITY OF 0.75 WATT AT 20 KELVIN. THE CRYOGENIC UNIT WILL HAVE A VOLUME OF LESS THAN 16 cm<sup>3</sup>, AND CAN PROVIDE COOLING FOR 5 MINUTES AFTER A COOLDOWN PERIOD OF LESS THAN 20 SECONDS. THE CRYOCOOLER USES A NEW FABRICATION TECHNIQUE THAT LEADS TO A HIGH RELATIVE EFFICIENCY WITH A MINIMUM VOLUME.

ALABAMA CRYOGENIC ENGINEERING INC PO BOX 2451 HUNTSVILLE, AL 35804 DR JOHN B HENDRICKS TITLE: A FAST COOLDOWN MICROMINIATURE LINDE-HAMPSON CRYOCOOLER T 94 OFFICE: ASD/XR	AF	\$ 49,959
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THIS PROPOSAL COVERS THE DEVELOPMENT OF A FAST COOLDOWN LINDE-HAMPSON CRYOCOOLER. BOTH SINGLE STAGE UNITS, REACHING 80 KELVIN, AND MULTI-STAGE UNITS, REACHING APPROXIMATELY 4 KELVIN ARE POSSIBLE. THE UNIT CAN BE USED WITH GAS BOTTLES FOR SHORT TERM USE. FOR LONG LIFETIME EITHER A MECHANICAL OR ABSORPTION COMPRESSOR CAN BE USED. THE UNIT CAN BE SCALED TO MATCH THE COOLING LOAD, AND MICROMINIATURE UNITS ARE POSSIBLE, USING A PROPRIETARY MANUFACTURING METHOD.

ALPHATECH INC 111 MIDDLESEX TURNPIKE BURLINGTON, MA 01803 DR JOHN J SHAW TITLE: INNOVATIVE MULTI-SPECTRAL COUNTERMEASURE MANAGEMENT T 62 OFFICE: CECOM/AMSEL	ARMY	\$ 49,998
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ALPHATECH PROPOSES TO DEVELOP INNOVATIVE ALGORITHMS FOR AIRBORNE

FISCAL YEAR 1986

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MULTI-SPECTRAL COUNTERMEASURE MANAGEMENT BUILT UPON OUR PREVIOUSLY DEVELOPED ADVANCED ALGORITHMS FOR ELECTRONIC COUNTERMEASURE (ECM) POWER MANAGEMENT FOR USE AGAINST GROUND-BASE AIR DEFENSE THREATS. THESE ALGORITHMS DETERMINE OPTIMAL COUNTERMEASURE SEQUENCES BY PREDICTING IN REAL-TIME HOW THREATS WILL RESPOND TO COUNTERMEASURES. IN SIMULATIONS AGAINST A PARTICULARLY LETHAL ANTI-AIRCRAFT ARTILLERY (AAA) SYSTEM, OUR PREDICTIVE ALGORITHM REDUCED THE EXPECTED KILL PROBABILITY BY OVER 50 PERCENT WITH RESPECT TO NON-PREDICTIVE ALGORITHMS. WE BELIEVE THAT THE CONCEPTS WE PIONEERED FOR OUR ECM POWER MANAGEMENT ALGORITHM CAN BE THE BASIS FOR A LARGE, MORE COMPREHENSIVE MULTI-SPECTRAL COUNTERMEASURE SYSTEM. FOREMOST AMONG THESE CONCEPTS ARE ALGORITHMS TO PREDICT, IN REAL-TIME, THREAT TRACKING/FIRING STATES, LOOK-AHEAD ALGORITHMS TO PREDICT HOW A THREAT WILL RESPOND TO A FUTURE SEQUENCE OF COUNTERMEASURES, AND ALGORITHMS TO EXPLOIT COLLATERAL COUNTERMEASURE APPLICATION. WE PROPOSE AN EXPLORATORY RESEARCH EFFORT TO DETERMINE THE FEASIBILITY OF EXTENDING OUR CONCEPTS TO THE RANGE OF THREATS AND RADIO-FREQUENCY/ELECTRO-OPTICAL/INFRARED COUNTERMEASURES ENVISIONED FOR YEAR 2000 AND BEYOND.

ALPINE RESEARCH INC  
1930 CENTRAL AVE - STE F  
BOULDER, CO 80301  
PAUL C RAMER

NAVY

\$ 48,932

## TITLE:

WAXLESS REDUCED LENGTH MILITARY SNOW SKI  
T 13 OFFICE: USMC/LBC

THIS PROJECT WILL RESEARCH AVAILABLE DATA AND LITERATURE TO SELECT THE MATERIALS, TECHNOLOGY, AND CONSTRUCTION METHODOLOGY USEFUL FOR THE DEVELOPMENT OF A WAXLESS, REDUCED LENGTH MILITARY SNOW SKI. FROM THE DATA BASE DEVELOPED, THOSE SKIS AND TECHNOLOGY MOST PROMISING TO FULFILL THE GOALS OF THE CONTRACT WILL BE PURCHASED/CONSTRUCTED AND TESTED FOR THEIR SUITABILITY AS A MILITARY SNOW SKI. PARTICULAR ATTENTION WILL BE PAID TO DEVELOPING A SKI THAT IS EASY TO TRAIN ON, MEETS RELIABILITY AND MAINTAINABILITY STANDARDS, AS WELL AS BEING SUITABLE FOR MILITARY TYPE SKIING. DURING THE LAST SEVERAL YEARS, THERE HAS BEEN A NUMBER OF TESTS FOR A WAXLESS SKI. MOST OF THESE TESTS HAVE RESULTED IN FAILURE FOR A NUMBER OF REASONS. CURRENT TECHNOLOGICAL DEVELOPMENTS OF MATERIAL AND CONSTRUCTION TECHNIQUES HAVE MADE A WAXLESS SNOW SKI A POSSIBILITY AT THIS TIME. THE PROJECT WILL EVALUATE PAST, CURRENT, AND DEVELOPING CONCEPTS THAT WILL

FISCAL YEAR 1986

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MAKE THE GOAL A REALITY.

ALTUS CORP 1610 CRANE CT SAN JOSE, CA 95122 P J WILSON TITLE: HIGH PD RESERVE LTC BATTERY T 177 OFFICE: AFWAL/PO	AF	\$ 49,009
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MANY MISSILE ADVANCED BATTERY APPLICATIONS ACROSS ALL MILITARY SERVICES CALL FOR A VARIETY OF CHARACTERISTICS WHICH CAN NOT ALWAYS BE MET WITH A SINGLE ELECTRO-CHEMISTRY. TYPICAL REQUIREMENTS MAY WELL INCLUDE THE FOLLOWING: 1. RAPID ACTIVATION TIME (LESS THAN 500 msec). 2. BROAD OPERATING TEMPERATURE RANGE (-54 DEG C TO +71 DEG C). 3. TEN YEAR STORAGE LIFE. 4. FIVE MINUTE RUN TIME OR LONGER. 5. MAXIMUM POWER AND ENERGY DENSITY FOR 100-200 VOLT BATTERY. THE DESIGN APPROACH PRESENTED HEREIN IS TO COMBINE THE BEST FEATURES OF A THERMAL BATTERY (RAPID ACTIVATION TIME AND LOG TEMPERATURE PERFORMANCE) WITH THOSE OF AN LTC BATTERY (EXTENDED RUN TIME, GOOD VOLTAGE REGULATION, HIGH POWER AND ENERGY DENSITY), TO FORM A HYBRID BATTERY. THE SPECIFIC OBJECTIVE OF THE WORK IS TO DEMONSTRATE FEASIBILITY.

AMERASIA TECHNOLOGY INC 2239 TOWNSGATE RD - STE 208 WESTLAKE VILLAGE, CA 91361 DR TEONG C LIM TITLE: REAL TIME BATTLE MANAGEMENT SIGNAL PROCESSOR T 3 OFFICE:	SDIO	\$ 75,061
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THERE IS A NEED IN BATTLE MANAGEMENT FOR BROAD-BAND ADAPTIVE CORRELATION BASED RECEIVERS FOR RADAR AND INFRARED SIGNAL SPECTRUM ANALYSIS OPERATING IN REAL TIME. A SURFACE ACOUSTIC WAVE (SAW) COMPRESSIVE RECEIVER UTILIZING ADAPTIVE CHIRP FOURIER TRANSFORMATION (CFT) IS PROPOSED FOR PROCESSING DOPPLER OVER LARGE BANDWIDTHS WITH HIGH ACCURACY (<1 M/SEC) IN REAL TIME FOR BATTLE MANAGEMENT. PRELIMINARY ANALYSIS INDICATES CFT PROCESSORS ARE CAPABLE OF 2 GFLOPS (BILLIONS OF OPERATIONS PER SECOND) SPEED AND 80 DB DYNAMIC RANGE. ADAPTIVE CFT SYSTEMS WITH 100% PROBABILITY OF INTERCEPT WILL BE ANALYZED AND DOPP-

FISCAL YEAR 1986

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LER SIMULATION STUDIES MADE TO ACHIEVE OPTIMUM RESOLUTION. STUDIES WILL BE APPLIED TO CASES WHERE THE BACKGROUND NOISE CONTAINS CHAFF INDUCED CLUTTER AND DECOY INTERFERENCE. THE SYSTEM WILL BE ANALYZED IN TERMS OF PERFORMANCE INDICES SUCH AS SIGNAL-TO-NOISE, DYNAMIC RANGE, INTERCEPT PROBABILITY, AND CORRELATION EFFICIENCY. A HARDWARE DEVELOPMENT PLAN WILL DETERMINE THE SUBSYSTEM COMPONENT AND CIRCUIT REQUIREMENTS FOR A REAL TIME BATTLE MANAGEMENT CFT SYSTEM.

AMERASIA TECHNOLOGY INC  
2239 TOWNSGATE RD - STE 208  
WESTLAKE VILLAGE, CA 91361  
DR TEONG C LIM  
TITLE:  
DIGITIZER 8-BIT GIGA-HERTZ  
T 30 OFFICE: USMC/NCSC

NAVY \$ 49,964

AN 8-BIT GHz DIGITIZER IS PROPOSED WITH A FRONT-END ANALOG DEMULTIPLEXER USING GaAs SAMPLE-AND-HOLD CIRCUITS FOR CONVERTING THE INPUT SIGNAL DOWN TO 125 MHz. A BANK OF SILICON 80BIT 125-MHz A/D CONVERTERS ARE THEN USED FOR SIGNAL DIGITIZATION. DIGITIZED DATA ARE FURTHER DEMULTIPLEXED BEFORE STORING INTO ECL MEMORY. THE ADVANTAGES OF THE PROPOSED APPROACH ARE THAT: (1) THE REQUIRED GaAs CIRCUITS ARE MINIMAL AND THE PERFORMANCE OF THESE CIRCUITS HAVE BEEN DEMONSTRATED AND THE REST OF THE COMPONENTS FOR THE PROPOSED SYSTEM ARE ALL SILICON ICs WHICH ARE COMMERCIALY AVAILABLE THUS RESULTING IN AN OVERALL LOW-RISK APPROACH, AND (2) THE PROPOSED ARCHITECTURE ALLOWS FUTURE EXTENSION TO A LONGER SAMPLE WINDOW, HIGHER BIT ACCURACY, AND HIGHER SAMPLING FREQUENCIES. PHASE I PROGRAM WILL PROVIDE A DETAILED ANALYSIS OF SYSTEM DESIGN AND COMPUTER SIMULATED CIRCUIT DESIGN WHICH WILL BE USED FOR IC FABRICATION AND BREADBOARDING IN PHASE II.

AMERICAN HYPERFORM INC  
PO BOX 9077  
ESSINGTON, PA 19029  
DR W NOVIS SMITH

NAVY \$ 52,000

TITLE:  
ABRASION RESISTANT NON-FLAMMABLE OXIDIZED POLYACRYLONITRILE  
FABRICS  
T 73 OFFICE: NAVSUP

ONE OF THE MOST OUTSTANDING FABRICS FOR THE PROTECTION OF PERSONNEL

FISCAL YEAR 1986

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WITH RESPECT TO EXPOSURE TO DIRECT FLAME AND YET HAS THE FEEL OF A SOFT TEXTILE IS COMPOSED OF OXIDIZED POLYACRYLONITRILE FIBER (OPF). HOWEVER OPF FABRICS HAVE LACKED SUFFICIENT ABRASION RESISTANCE FOR USE IN PROTECTIVE CLOTHING. THE NAVY CLOTHING AND TEXTILE RESEARCH CENTER (Z. KUPFERMAN AND M. ROY) HAS DEMONSTRATED THE OPF FABRICS CAN OFFER PROTECTION IN FLAME EXCURSIONS UP TO 5500 DEG F. AMERICAN HYPERFORM PROPOSES TO MAXIMIZE THE ABRASION RESISTANCE OF OPF FABRICS BY THE INTIMATE BLENDING OF 10 TO 20% OF VARIOUS ABRASION AND FIRE RESISTANT FIBERS IN THE OPF YARNS WHICH WILL BE WOVEN INTO 2x2 TWILL AND JERSEY KNOT TEST PIECES FOR EVALUATION. THE EVALUATION WILL DETERMINE WHAT PERCENTAGES OF PBI, ARAMIDE, OR FR WOOL FIBERS ARE NEEDED TO ACHIEVE SATISFACTORY ABRASION RESISTANCE AND MAXIMIZE THE AMOUNT OF OPF IN THE YARN AND SUBSEQUENT FABRICS. THE BEST COMBINATION FABRIC OF BLENDED OPF YARNS WILL BE WOVEN OR KNITTED IN SUFFICIENT QUANTITIES TO MAKE ABOUT FOUR PROTOTYPES EACH OF A T-SHIRT, SHIRT, COVERALLS, ANTIFLASH MASK, AND GLOVES. THESE ITEMS WILL BE SUBMITTED TO NAVY CLOTHING AND TEXTILE RESEARCH CENTER FOR EVALUATION. THEIR COMMENTS WILL BE INCORPORATED FOR LARGER RUNS OF QUANTITIES OF FABRIC AND APPAREL FOR FIELD TESTING IN PHASE II.

AMERICAN RESEARCH CORP OF VA  
PO BOX 3406 - 642 FIRST ST  
RADFORD, VA 24143  
DR M G NIIMURA

SDIO

\$ 67,349

TITLE:

NON-LINEAR ELECTROMAGNETIC RAIL GUN

T 2 OFFICE:

ELECTROMAGNETIC LAUNCHERS HAVE POSSIBLE APPLICATIONS TO A VARIETY OF DEFENSE NEEDS. IDEAS ARE BEING SOUGHT FOR NOVE ACCELERATORS CAPABLE OF DRIVING SMALL MASSES (1 TO 20 GM) TO HYPER VELOCITIES ABOVE 20 KM/S. FOR THE CONVENTIONAL LINEAR RAIL GUNS, THE LENGTH OF RAIL BECOMES A SIGNIFICANTLY LONG IN ORDER TO ACHIEVE THE GOAL. FURTHER, USE OF THE RAIL GUN IN SPACE OR IN FIELD REQUIRES NATURALLY LIGHT WEIGHT AND VOLUME EFFECTIVENESS. THIS PROPOSAL SUGGESTS NOVEL LAUNCHER DESIGNS AND THE LIMITED DEMONSTRATION FOR FEASIBILITY. PROPOSED NON-LINEAR OR CIRCULAR RAIL GUNS ARE COMPACT YET CAPABLE TO PROVIDE A LONG ACCELERATION LENGTH. CURVATURE EFFECTS, DRAG FORCES, AND INSULATION PROBLEMS ARE THOROUGHLY STUDIED BEFORE OR IN-PARALLEL TO THIS APPROACH. BOTH TYPES OF THE CIRCULAR RAIL GUN WITH AND WITHOUT EXTERNAL MAGNETIC FIELD ARE POSSIBLE AND ARE DESCRIBED HERE.



FISCAL YEAR 1986

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ALSO PROPOSED IS AN EXTENSION OF THE NEW ROTATING ARMATURE CONCEPT INTO A TRUELY REPETITIVE OPENING SWITCH. SUCH AN OPENING SWITCH IS ESSENTIAL FOR THE INDUCTIVE ENERGY STORAGE SYSTEM TO WHICH RAIL GUNS ARE INSTALLELD. FINAL PRODUCT FROM THIS PROPOSED WORK WILL BE A REPETITIVELY OPERATING CIRCULAR RAIL GUN SYSTEM WHOSE OVERALL VOLUME IS MINIMIZED.

AMERICAN RESEARCH CORP OF VA PO BOX 3406 - 642 FIRST ST RADFORD, VA 24143 DR R J CHURCHILL TITLE: LASER FIBER OPTIC SENSOR FOR HUMAN BIOMAGNETIC MEASUREMENTS T 278 OFFICE: AMD/RDO	AF	\$ 67,240
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BIOMAGNETIC MEASUREMENTS CAN NOW MAKE UNIQUE AND SIGNIFICANT CONTRIBUTIONS TO THE STUDY OF ACTIVITY IN THE HUMAN BODY. MOST MEASUREMENTS ARE MADE WITH THE SQUID MAGNETOMETER WHICH HAS SEVERAL MAJOR DISADVANTAGES. THE LONG TERM TARGET OF OPPORTUNITY IN THIS PROPOSAL IS THE DEVELOPMENT OF A COMPACT, SENSITIVE, ROOM TEMPERATURE BIOMAGNETIC SENSOR BASED ON A LASER-STIMULATED FIBER OPTIC INTERFEROMETER WITH MAGNETOSTRICTIVE FIELD SENSING ELEMENTS. SPECIFIC AIMS INCLUDE EVALUATION OF HUMAN FIELD EMISSIONS, ASSESSMENT OF PRESENT TECHNOLOGY, IDENTIFICATION OF FIBER OPTIC SENSOR PARAMETERS, DESIGN AND DEVELOPMENT OF A PROTOTYPE SYSTEM, MEASUREMENTS OF SIMULATED HUMAN MAGNETIC FIELDS, CONCEPTUAL DESIGN OF A MODEL FOR ENGINEERING DEVELOPMENT AND CLINICAL TESTING IN THE PHASE II PROGRAM. TO ACHIEVE THESE GOALS THE METHODOLOGY INCLUDES A PARAMETRIC STUDY OF SIMULATED FIELD EMISSION VARYING IN AMPLITUDE, FREQUENCY, SPATIAL DISTRIBUTION AND NOISE ENVIRONMENT.

AMERICAN RESEARCH CORP OF VA PO BOX 3406 - 642 FIRST ST RADFORD, VA 24143 DR M G NIIMURA TITLE: MINIATURE ELECTRON BEAM ACCELERATOR INCORPORATING ELECTRON SOURCE AND HIGH GRADIENT ACCELERATION MECHANISM T 18 OFFICE: DARPA	DARPA	\$ 67,349
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LIGHT WEIGHT, HIGH ENERGY CHARGED PARTICLE BEAM PRODUCTION IS

FISCAL YEAR 1986

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FEASIBLE WHEN THE ACCELERATION POTENTIAL IS GENERATED FROM AN INDUCTIVE ENERGY STORAGE SYSTEM. AN INTENSIVE, COPIOUS X-RAY RADIATION SOURCE IS THEREFORE OBTAINABLE SIMULTANEOUSLY THROUGH THE HIGH-CURRENT ELECTRON BEAM AND METAL TARGET INTERACTION. USE OF A PLASMA OPENING SWITCH IS PROPOSED FOR OPENING THE INDUCTIVE CIRCUIT BECAUSE IT INCLUDES THE CHARGED PARTICLE SOURCES AUTOMATICALLY IN THE WORKING GAS OR IN THE METAL VAPOR PLASMA ABLATED FROM THE ELECTRODE MATERIAL, THEREBY ELIMINATING THE NEED OF ADDITIONAL ELECTRON OR ION SOURCES. USE OF THE DENSE PLASMA FOCUS (DPF) AS AN OPENING SWITCH CAN INCORPORATE THE STORAGE INDUCTOR AND LOAD GAP, AS WELL AS THE PARTICLE SOURCE AND LOW VOLTAGE CAPACITOR BANK, ALL IN ONE VOLUME-EFFECTIVE UNIT SUITABLE FOR SPACE AND LABORATORY INVESTIGATION OF THE BEAM PROPAGATION. CASCADE ACCELERATION OF CHARGED PARTICLES IS SUGGESTED FOR ENERGY HIGHER THAN READILY AVAILABLE FROM THE TABLE-TOP DEVICE. THE PROPOSED PROJECT INCLUDES CHARACTERIZATION OF THE CHARGED BEAMS AND X-RAYS, LABORATORY DEMONSTRATION OF THE PROPAGATION THROUGH NATURAL AND DISTURBED ENVIRONMENTS, AND IMPROVEMENT OF THE AVERAGE POWER BY REPETITIVE OPERATION.

AMERICAN RESEARCH CORP OF VA  
PO BOX 3406 - 642 FIRST ST  
RADFORD, VA 24143  
DR P W CHAN

DARPA

\$ 66,759

## TITLE:

MICROWAVE NDE SENSOR FOR IN-PROCESS CONTROL IN THE MANUFACTURE OF  
CARBON-CARBON COMPOSITES

T 10 OFFICE: DARPA

THE INTELLIGENT PROCESSING OF MATERIALS IS A NOVEL CONCEPT IN MATERIALS PROCESSING IN WHICH INFORMATION FROM REAL TIME, IN-SITU MICROSTRUCTURAL SENSORS AND PROCESS MODELS ARE COMBINED WITH ARTIFICIAL INTELLIGENCE APPROACHES TO CONTROL A MATERIALS PROCESS. THE IN-SITU SENSORS ARE A KEY TO THIS TECHNOLOGY SINCE INFORMATION ABOUT THE "STATE" OF THE MATERIAL MUST BE ASCERTAINED. THEREFORE, THIS PROPOSAL WILL EXAMINE THE USE OF MICROWAVE ABSORPTION FOR THE IN-SITU MONITORING OF CARBON CARBON PROCESSING. THE DIELECTRIC BEHAVIOR OF POLYMERS HAVE ALREADY BEEN DEMONSTRATED TO BE USEFUL IN MONITORING THEIR CURE. THE USE OF MICROWAVE ENERGY AS A MEANS TO GET AT THIS AND OTHER ELECTRONIC PARAMETERS WHICH MAY BE DIRECTLY RELATABLE TO MATERIALS PROPERTIES IS A UNIQUE APPROACH WHICH DESERVES ATTENTION. THERE ARE TWO KEY TECHNICAL ISSUES INVOLVED IN THIS EFFORT. HOW FAR

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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CAN ONE GO IN THE PROCESS BEFORE THE CARBON-CARBON BECOMES TOO CONDUCTIVE AND CAN ONE CREATE A MICROWAVE CAVITY IN THE OPERATING ENVIRONMENT. THE POTENTIAL BENEFITS TO A WIDE RANGE OF DoD AND COMMERCIAL APPLICATIONS FOR DETERMINING FEATURES OF THE MATERIAL MAKES THIS RESEARCH VERY INTERESTING AND WORTHY OF SUPPORT.

AMHERST SYSTEMS INC	AF	\$ 50,000
1 AMERICAN DR		
BUFFALO, NY 15225		
DR EDWARD G EBERL		
TITLE:		
IR/EO TARGET GENERATION CONCEPTS		
T 94 OFFICE: ASD/XR		

MAJOR IMPROVEMENTS ARE REQUIRED IN SIMULATION TEST SYSTEMS IN ORDER TO TEST INTEGRATED SENSOR SYSTEMS THAT COMBINE RF, INFRARED AND ELECTRO-OPTICAL SENSORS. RF ENVIRONMENT SIMULATORS CAN NOW GENERATE EMISSIONS ASSOCIATED WITH MAJOR COMBAT SCENARIOS. NO EQUIVALENT CAPABILITY EXISTS TO GENERATE LARGE NUMBERS OF IR AND EO TARGET SIGNATURES SO THAT IR AND EO SENSORS CAN BE TESTED IN THESE SAME SCENARIOS. THIS STUDY WILL INVESTIGATE METHODS TO DIGITALLY GENERATE IR AND EO TARGETS BASED ON THE TECHNOLOGY THAT WAS SUCCESSFULLY EMPLOYED TO DIGITALLY GENERATE SIGNALS FOR RF RECEIVER SYSTEMS. THIS WAS DONE BY DUPLICATION OF THE DIGITAL OUTPUT OF THE FRONT END OF THE RF RECEIVER SYSTEM UNDER TEST. THIS STUDY THUS FOCUSES ON UNDERSTANDING THE IR SENSOR'S (E.G., WARNING RECEIVER) DESIGN AND PERFORMANCE CHARACTERISTICS AND THE CHARACTERISTICS OF IR TARGET SIGNATURES, AND DESCRIBING A DIGITAL STIMULATION APPROACH. EO SIGNAL GENERATION BY USE OF A GRAPHICS PROCESSOR SYSTEM WILL ALSO BE INVESTIGATED.

AMTEC ENGINEERING INC	AF	\$ 49,690
100001 NE 4TH ST		
BELLEVUE, WA 98004		
SCOTT T IMLAY		
TITLE:		
A COUPLED ADAPTIVE GRID/NAVIER-STOKES SOLUTION PROCEDURE FOR HIGH ENERGY LASER FLOWS		
T 86 OFFICE: AFWL/PRC		

AN EFFICIENT COMPUTATIONAL METHOD IS PROPOSED FOR MODELING THE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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COMPLEX PHYSICAL PHENOMENA OCCURING IN HIGH ENERGY CONTINUOUS WAVE LASER FLOW FIELDS. THESE FLOWS TYPICALLY CONTAIN BOUNDARY LAYERS, MIXING LAYERS, WAKES, AND EMBEDDED SHOCK WAVES. IT IS DIFFICULT TO GENERATE A MESH APRIOR WHICH WILL RESOLVE ALL FEATURES OF THE FLOW. THEREFORE, AN ADAPTIVE GRID TECHNIQUE WILL BE USED AND COUPLED TO AN UNFACTORED IMPLICIT FINITE VOLUME FLOW SOLVER, THE EFFICIENCY OF WHICH IS VERY INSENSITIVE TO MESH SPACING. THE PERFORMANCE OF THE COUPLED ADAPTIVE GRID/FLOW SOLVER WILL BE EVALUATED FOR A CHEMICAL LASER NOZZLE/CAVITY FLOW.

ANADAC INC 1725 JEFF DAVIS HWY/CRYSTAL SQ 2-#604 ARLINGTON, VA 22202 FRANK T MENEELY TITLE: TAILORING CONTRACT DATA REQUIREMENTS T 44 OFFICE: SPAWAR	NAVY	\$ 41,133
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PROJECT OBJECTIVES ARE TO INVESTIGATE RESTRUCTURING DD FORM 1423 TO PROMOTE TAILORING OF DATA REQUIREMENTS TO THE PARTICULAR NEEDS OF AN ACQUISITION PROJECT AND ESTABLISH SYSTEMATIC GUIDELINES FOR IMPLEMENTATION. A LOGICAL AND ORDERED METHODOLOGY WILL BE DEVELOPED DURING THE PHASE I STUDY TO ACCOMPLISH THESE OBJECTIVES.

ANADIGICS INC 35 TECHNOLOGY DR WARREN, NJ 07060 SARJIT S BHARJ TITLE: MANUFACTURING COST ANALYSIS - GALLIUM ARSENIDE MMIC FOR PHASE ARRAY RADAR TRANSMIT/RECEIVER MODULES T 35 OFFICE: SPAWAR	NAVY	\$ 49,533
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MMIC YIELD IS THE SIGNIFICANT FACTOR IN DETERMINING BOTH CHIP COST AND LEVEL OF INTEGRATION. IN ORDER TO MAXIMIZE YIELD, IT IS NECESSARY TO ESTABLISH A CONSISTENT, REPRODUCIBLE PROCESS CONTROL, COUPLED WITH CREATIVE CIRCUIT DESIGN TECHNIQUES USED TO CREATE SHIP SETS WHICH ARE TOLERANT TO PROCESS VARIATIONS. A LARGE PROPORTION OF THE FINAL COST FOR THE END PRODUCT IS RELATED TO THE ASSEMBLY AND FINAL TESTING. THIS EXPLORATORY STUDY WILL CONDUCT COST ANALYSIS RESEARCH

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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ON COMPUTER ASSISTED TECHNIQUES THAT WILL HAVE A DIRECT IMPACT ON THE YIELDS AND HENCE, COSTS AT VARIOUS MONITOR POINTS DURING THE MANUFACTURE, ASSEMBLY AND TESTING OF MMICS. AN X-BAND PHASE ARRAY RADAR CHIP SET WILL BE UTILIZED AS A TEST VEHICLE FOR THIS STUDY. DIRECT COST AND YIELD COMPARISONS WILL BE CONDUCTED AGAINST AN EQUIVALENT MMIC FABRICATION.

ANALYTICAL LUMINESCENCE LAB	ARMY	\$ 46,377
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11760 SORRENTO VALLEY RD - STE E  
SAN DIEGO, CA 92121  
JON C WANNLUND

## TITLE:

A BIOLUMINESCENT IMMUNOASSAY (BIA) USING LOW COST AND/OR DISPOSABLE INSTRUMENTATION FOR THE DIAGNOSIS OF DISEASES OF MILITARY IMPORTANCE

T 210 OFFICE: AMRDC/SGRD

THE PRIMARY OBJECTIVES OF THIS PROJECT ARE TO DEVELOP A RAPID SENSITIVE, AND PORTABLE DETECTION SYSTEM BY USING BIOLUMINESCENCE AS THE LABEL FOR THE IDENTIFICATION OF DISEASE-CAUSING AGENTS AS WELL AS THE DIAGNOSIS OF DISEASE. BIOLUMINESCENT LABELS WHEN LINKED TO THE TARGETING AGENT (I.E. MONOCLONAL ANTIBODIES OR DNA PROBES) OFFER EXTREME SENSITIVITY IN DETECTION AND THE ABILITY TO MONITOR AND MEASURE THE ASSAY WITH SMALL, LOW COST, PORTABLE DEVICES. AFTER IDENTIFYING THE AGENTS TO BE DETECTED, THE BIOLUMINESCENT DETECTION SYSTEM IS COVALENTLY ATTACHED TO THE BEST TARGETING AGENT THAT WILL GIVE SPEED AND SENSITIVITY. OPTIMIZATION OF THE TEST SYSTEM WILL REQUIRE DETERMINING THE BEST COVALENT LINKAGE FOR THE BIOLUMINESCENT LABEL TO THE TARGETING AGENT AND THE BEST CONCENTRATION OF REAGENTS TO PROMOTE SPEED AND SENSITIVITY. THE SPECIMEN FLUID USED WILL DICTATE THE SYSTEM'S APPROACH TO DETECTING THE DESIRED AGENT.

ANALYTICAL METHODS INC	AF	\$ 50,000
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2133 152ND AVE NE  
REDMOND, WA 98052  
DR BRIAN MASKEW

## TITLE:

A PREDICTION MODEL FOR ADVANCED LEADING-EDGE VORTEX FLOW CONTROL

T 139 OFFICE: AFWAL/FI

THE OBJECTIVE IS TO DEVELOP A TOOL FOR DESIGNING VORTEX FLAPS ON

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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ADVANCED FIGHTER AIRCRAFT INCLUDING THE EFFECTS OF VISCOSITY. ANALYTICAL METHODS, INC. PROPOSES TO USE AN UNSTEADY TIME-STEPPING VERSION OF ITS SURFACE SINGULARITY PANEL METHOD, VSAERO, AS A BASIS FOR THIS WORK. THIS WILL GENERATE THE PRELIMINARY VORTEX STRUCTURE (LEADING-EDGE VORTICE, FOREBODY VORTICES, ETC.) FOR THE COMPLETE CONFIGURATION; THE SOLUTION WILL BE COMPUTED AS A LIMITING STATE AT CONSTANT INCIDENCE WITHOUT CONICAL FLOW OR SLENDER BODY ASSUMPTIONS. COUPLED BOUNDARY LAYER CALCULATIONS--PROCEEDING AWAY FROM PREDICTED ATTACHMENT LINES--WILL PROVIDE DISPLACEMENT EFFECTS AND SEPARATION LOCATIONS. THE LATTER WILL INDICATE WHERE NEW WAKE SHEETS (E.G., SECONDARY VORTICES) NEED TO BE ADDED BEFORE COMPUTING THE NEW PRESSURE DISTRIBUTION FOR THE NEXT CYCLE. EXISTING EXPERIMENTAL DATA WILL BE USED FOR CORRELATION PURPOSES AND TO HELP REFINE MODELING DETAIL. IN DEVELOPING THIS APPROACH INTO A PRACTICAL DESIGN TOOL, THE AIM WILL BE TO MAINTAIN THE ARBITRARY GEOMETRY CAPABILITY, THE LOW COMPUTING COST AND THE EASE OF USE OF THE PANEL METHOD AND TO MODEL THE EFFECTS OF VISCOSITY AS CLOSELY AS POSSIBLE.

ANALYTICAL SOFTWARE INC 10939 MCCREE RD DALLAS, TX 75238 MARK HALEY TITLE: AIR FORCE PRESENTATION GRAPHICS T 93 OFFICE: ASD/EN	AF	\$ 41,370
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THE OBJECTIVE IS TO CREATE PRESENTATION GRAPHICS SOFTWARE WHICH THE AIR FORCE WILL USE IN ENGINEERING/TECHNICAL BRIEFINGS. THIS SOFTWARE WILL OPERATE ON ZENITH-100 MICROCOMPUTERS AS WELL AS LARGE SCREEN PROJECTION SYSTEMS, AND WILL HAVE THE FOLLOWING FEATURES: 1) DISPLAY VARIOUS TYPES OF GRAPHS (BAR, PIE, LINE, AREA FILLS, TREND LINES, LINEAR REGRESSIONS, X-Y PLOTS, LOG-LOG CHARTS) AND CALCULATE STATISTICAL RELATIONSHIPS. 2) INTEGRATE TEXT AND GRAPHICS IN ONE CHART. 3) ACCESS DATA FROM LOTUS 1-2-3 AND OTHER SOFTWARE. 4) CREATE AUTOMATED SLIDE SHOWS. 5) BE MENU-DRIVEN AND REQUIRE NO COMPUTER BACKGROUND TO USE. ANALYTICAL SOFTWARE WILL USE ITS EXISTING SOFTWARE PRODUCT, BOARDROOM GRAPHICS, WHICH ALREADY HAS MANY OF THESE DESIRED FEATURES, AS THE BASIS FOR THE WORK. ENHANCEMENTS WILL BE MADE TO MEET THE FOLLOWING AIR FORCE REQUIREMENTS: MAKE THE SOFTWARE COMPATIBLE WITH Z-100 HARDWARE, INTEGRATE GRAPHICS AND TEXT CHARTS ON-SCREEN, ACCESS DATA FROM dBASE AND WORDSTAR SOFTWARE, AND INCREASE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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THE FLEXIBILITY OF THE SLIDE SHOW OPTIONS.

ANALYTICAL SOFTWARE INC 10939 MCCREE RD DALLAS, TX 75238 MARK HALEY	ARMY	\$ 45,630
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## TITLE:

COMPUTER-AIDED JAMMING CALCULATIONS FOR RANGE AND DOPPLER  
CORRELATED RADARS

T 59 OFFICE: CECOM/AMSEL

THE OBJECTIVE IS TO CREATE A RADAR JAMMING COMPUTER MODEL WHICH EASILY PERMITS ARMY PERSONNEL TO CALCULATE THE JAMMING PARAMETERS WHICH COUNTER BOTH RANGE DELAY AND DOPPLER RADARS. THIS SOFTWARE MUST BE WRITTEN IN BASIC, RUN ON AN MS-DOS COMPUTER AND THE SOURCE CODE SHOULD BE INCLUDED WITH UNLIMITED RIGHTS TO THE GOVERNMENT. KEY OBJECTIVES IN CREATING THIS SOFTWARE ARE AS FOLLOWS: 1) REVIEW EXISTING JAMMING MODELS AND DEFINE THE REQUIREMENTS FOR A PERSONAL COMPUTER BASED JAMMING MODEL. THE PRIMARY TECHNIQUES TO COUNTER RANGE DELAY AND DOPPLER RADAR ARE RANGE-GATE AND VELOCITY-GATE STEALERS -TWO PRIME REQUIREMENTS FOR THE PC JAMMING MODEL. 2) DEVELOP AND TEST THE JAMMING MODEL. THE MODEL SHOULD BE MENU-DRIVEN WITH AN EASY-TO-USE UPDATE CAPABILITY. 3) ADD GRAPHICS TO THE JAMMING MODEL SO THAT THE PROGRAM WOULD AUTOMATICALLY PLOT THE NATURE OF THE RADAR THREAT AND THE APPROPRIATE JAMMING COUNTER-MEASURES. THESE GRAPHS WOULD PROVIDE A VALUABLE TRAINING TOOL FOR NOVICE USERS.

ANALYTICS INC 2500 MARYLAND RD WILLOW GROVE, PA 19080 JAMES STOKES	ARMY	\$ 49,860
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## TITLE:

AN ARTIFICIAL INTELLIGENT JOB PERFORMANCE AID (AIJPA) FOR ON-BOARD  
AUDIO TROUBLESHOOTING

T 118 OFFICE: TACOM/AMSTA

INTERMEDIATE MAINTENANCE IS NORMALLY ACCOMPLISHED BY HIGHLY TRAINED, HIGHLY SKILLED TECHNICANS. THE ABILITY TO PLACE SUCH SKILLED PERSONNEL IN "REMOTE-FIELD POSITIONS" HAS BECOME ECONOMICALLY IMPRACTICAL BASED ON THE NUMBER OF FAILURES THAT OCCUR AND THE HIGH COST

FISCAL YEAR 1986

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OF TRAINING. THIS BEING THE CASE, WE MUST LOOK TO STATE-OF-THE-ART ADVANCES IN ARTIFICIAL INTELLIGENCE TO BRING THE EXPERTISE OF THESE HIGHLY TRAINED TECHNICIANS TO THE AID OF THE PERSONNEL CURRENTLY IN THE FIELD. THE PRIMARY OBJECTIVE OF THIS RESEARCH PROGRAM IS TO ESTABLISH THE DESIGN FEASIBILITY OF A STAND-ALONE ARTIFICIAL INTELLIGENT JOB PERFORMANCE AID (AIJPA) FOR THE ACCOMPLISHMENT OF INTERMEDIATE MAINTENANCE TASKS. USING THIS AID WOULD ELIMINATE AND ALLOW THIS FUNCTION TO BE PERFORMED BY PERSONNEL TRAINED AT THE ORGANIZATIONAL MAINTENANCE LEVEL.

ANAMET LABS INC

AF

\$ 49,875

100 INDUSTRIAL WY

SAN CARLOS, CA 94070

DR ROCKY RICHARD ARNOLD

TITLE:

RAPID THERMAL LOADING OF DELAMINATED COMPOSITE STRUCTURES

T 132

OFFICE: AFWAL/FI

THE RESEARCH PROGRAM PROPOSED HEREIN IS DIRECTED TOWARDS DEVELOPING A THEORETICAL APPROACH TO THE PROBLEM OF RAPID THERMAL LOADING OF DELAMINATED COMPOSITE STRUCTURES. THE STRUCTURE TO BE EXAMINED INCLUDE FLAT AND SHALLOW-CURVED PLATES AND CYLINDRICAL SHELLS. USING HAMILTON'S PRINCIPLE AND THE REISSNER VARIATION THEOREM, A NEW DYNAMIC THERMOELASTIC VARIATIONAL PRINCIPLE WILL BE DEVELOPED. APPLICATION OF THIS PRINCIPLE TO BOTH PLATES AND SHELLS PROVIDES THE EQUATIONS OF DYNAMIC EQUILIBRIUM AND THE ASSOCIATED NATURAL AND GEOMETRIC BOUNDARY CONDITIONS. IMPORTANT PHYSICALLY OBSERVABLE CHARACTERISTICS OF COMPOSITE NOT USUALLY FOUND IN CLASSICAL APPROACHES, WILL BE INCLUDED IN THE THEORY. THESE CHARACTERISTICS INCLUDE TRANSVERSE SHEAR, MATERIAL NONLINEARITY AND DELAMINATION MECHANISM. IN THIS PHASE I EFFORT, THE THERMOELASTIC MODEL WILL BE DEFINED AND THE GOVERNING EQUATIONS DERIVED FOR BOTH CONTIGUOUS AND DELAMINATED PLATE AND SHELL STRUCTURE. SOLUTION OF THE GOVERNING EQUATIONS AND NUMERICAL EXAMPLES CONSTITUTES THE MAJOR EMPHASIS OF ANY PHASE II WORK.

ANAMET LABS INC

AF

\$ 49,031

100 INDUSTRIAL WY

SAN CARLOS, CA 94070

DANTON GUTIERREZ-LEMINI

TITLE:

COUPLED THERMOELASTIC CAPABILITY FOR COSMIC/NASTRAN

T 136

OFFICE: AFWAL/FI

THE RESEARCH PROPOSED HEREIN IS CONCERNED WITH THE DEVELOPMENT OF



FISCAL YEAR 1986

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THEORY AND SOFTWARE FOR THE ANALYSIS OF RAPIDLY-HEATED CRACKED STRUCTURES. THE FUNDAMENTAL PREMISE, UPON WHICH THIS EFFORT IS BASED, IS THAT THE PROBLEM OF CRACK PROPAGATION IN "HOT STRUCTURES" REQUIRES THE USE OF A COUPLED THERMOELASTIC ANALYSIS CAPABILITY. THUS, THE DESIGNER MUST HAVE AN ANALYTICAL TOOL THAT CAN BOTH SOLVE A COUPLED THERMAL AND STRUCTURAL PROBLEM AND DESCRIBE THE BEHAVIOR OF MATERIALS WHICH POSSESS ARBITRARY CRACKS. PHASE I RESEARCH WILL CULMINATE WITH THE IMPLEMENTATION OF A COUPLED THERMOELASTIC CAPABILITY INTO THE COSMIC/NASTRAN PROGRAM. THIS PARTICULAR COMPUTER CODE WAS CHOSEN BECAUSE OF ITS WIDE USE WITHIN THE DEPARTMENT OF THE AIR FORCE AND BECAUSE IT MAY BE EASILY MODIFIED. ALSO, IT SHOULD BE NOTED, THE PROPOSER HAS RECENTLY IMPLEMENTED INTO THE AIR FORCE COSMIC/NASTRAN PROGRAM A STATE-OF-THE-ART FRACTURE ELEMENT WHICH ALREADY HAS THE CAPABILITY TO HANDLE THERMAL AND BODY-FORCE LOADS. THUS, THE PRESENT PROPOSAL ADDRESSES AN URGENT NEED FOR THE ANALYSIS OF HOT STRUCTURES IN A VERY COST-EFFICIENT MANNER.

ANCO ENGINEERS INC  
9937 JEFFERSON BLVD  
CULVER CITY, CA 90232  
DR KARL BERNSTEIN

ARMY \$ 49,500

TITLE:  
AIR BLAST SHOCK MEASUREMENT TECHNIQUES  
T 166 OFFICE: TECOM/WSMR

THE BLAST DOSIMETER CONCEPTS PROVEN FOR THE U.S. ARMY MEDICAL CORPS WILL BE EXTENDED AND PROVEN TO MEET THOSE OF THE U.S. ARMY TEST AND EVALUATION COMMAND. PEAK BLAST WAVE PRESSURE AND BLAST WAVE MOMENTUM WILL BE RECORDED MECHANICALLY IN A SMALL, RUGGED, AND ACCURATE BUT INEXPENSIVE DEVICE. THE BLAST DOSIMETER WILL BE USER READABLE WITHOUT SPECIAL INSTRUMENTS, AND WILL BE EASY TO RESTORE FOR RE-USE. FOLLOWING CONCURRENCE WITH THE TEST AND EVALUATION COMMAND REGARDING SPECIFICATIONS FOR THE BLAST DOSIMETER, THE PHASE I PROGRAM WILL INCLUDE 1) DESIGN AND FABRICATION OF TEST ITEMS AND TEST FIXTURES; 2) SHOCK TUBE AND CHEMICAL HIGH EXPLOSIVE TESTING; AND 3) OPTIONAL TESTING IN HIGH AND VERY HIGH YIELD EXPLOSIONS. PROVISIONALLY CHOSEN RANGE SPECIFICATIONS INCLUDE 1) PEAK PRESSURE OF 5 TO 1,000 PSI; 2) MOMENTUM OF 10 TO 10,000 ACTUAL PSI MILLISECONDS; AND 3) POSITIVE PHASE DURATION OF 1 TO 1,000 MILLISECONDS.

FISCAL YEAR 1986

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ANDROBOT INC 2373 OLD OAKLAND RD SAN JOSE, CA 95131 THOMAS P NEFF TITLE: A FAMILY OF LOW COST MULTIPURPOSE MOBILE ROBOTS T 14 OFFICE: DARPA	DARPA	\$ 50,000

THE READY AVAILABILITY OF LOW COST MOBILE ROBOTS (LOCOMOBOT) WOULD PROVIDE RESEARCHERS IN ARTIFICIAL INTELLIGENCE THE TOOL NEEDED TO TEST THESE ALGORITHMS IN A "REAL WORLD" ENVIRONMENT, OUTSIDE OF THE MAINFRAME ON WHICH THEY WERE DEVELOPED. IN OUR PHASE I STUDY, WE WILL ESTABLISH TRADEOFF ANALYSIS FOR THE KEY CHARACTERISTICS OF MOBILITY, FUNCTIONALITY, DATALINK, AND POWER SOURCE. WE WILL THEN REVIEW OUR RECOMMENDATIONS FOR THE DESIGN OF A FAMILY OF LOCOMOBOTS WITH THE COGNIZANT ENGINEER. OUR DESIGN BASELINE WILL PROVIDE MODULAR EXPANSION CAPABILITY TO ADD ARMS, END EFFECTORS, STEREO VISION, WIDE BAND DATALINKS, AND OTHER FUNCTIONS AS MAY BE REQUIRED BY THE INDIVIDUAL RESEARCH NEEDS. THESE MODULES CAN BE ATTACHED TO THE BASELINE LOCOMOBOT AS NECESSARY, AND CAN BE OBTAINED AS "OPTIONAL EXTRA COST" ITEMS, THEREBY REDUCING THE COST OF THE BASIC LOCOMOBOT TO THOSE APPLICATIONS WHERE ALL FUNCTIONS ARE NOT REQUIRED. ANDROBOT IS ONE OF THE FEW SMALL BUSINESS COMPANIES ENGAGED EXCLUSIVELY IN THE DESIGN AND MANUFACTURE OF LOW COST MOBILE ROBOTS. ALL CONTAIN MICROPROCESSOR-BASED INTERNAL CONTROL SYSTEMS AND ARE PRINCIPALLY OPERATED BY REPROGRAMMABLE EMBEDDED SOFTWARE. THEY CONTAIN BIDIRECTIONAL DATALINKS TO PERMIT REMOTE TELEOPERATION FROM ALGORITHMS RESIDING ON MAINFRAME HOST COMPUTERS. WE PROPOSE TO BUILD ON THIS BASELINE OF EXPERIENCE TO PROVIDE A COMPREHENSIVE PLAN FOR DEVELOPMENT OF PROTOTYPES DURING THE PHASE II PROGRAM AND ESTIMATE THE UNIT COST IN PRODUCTION.

ANRO ENGINEERING CONSULTANTS INC FIVE MILITIA DR - STE 104 LEXINGTON, MA 02173 DR GERALD F ROSS TITLE: NOVEL FIBER OPTIC MULTIMODE FEED FOR MONOPULSE LIDAR ANTENNA APPLICATION T 3 OFFICE:	SDIO	\$ 54,247
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A NOVEL MULTIMODE FEED FOR A COHERENT AMPLITUDE MONOPULSE LIDAR IS

FISCAL YEAR 1986

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PROPOSED. THE HEART OF THIS FEED CONFIGURATION IS A MULTIMODE GRADIENT INDEX (SLAB) FIBER COUPLED TO THE SECOND FIBER IDENTICAL WITH THE FIRST TO FORM A MULTIMODE DIRECTIONAL COUPLER WITH SPECIALIZED PERFORMANCE. THE SIGNAL (BEACON OR LIDAR RETURN) IS FOCUSED BY THE ANTENNA OBJECTIVE ONTO THE PLANE END OF ONE FIBER. THE SPOT DISPLACEMENT IS THEN PROPORTIONAL TO THE ANGULAR DEVIATION OF THE TARGET. WITH PROPER DESIGN OF THE COUPLING REGION, A SIGNAL PROPORTIONAL TO THE ANGULAR DEVIATION IS COUPLED INTO THE SECOND FIBER (DIFFERENCE SIGNAL) LEAVING IN THE FIRST FIBER A CENTERED GAUSSIAN BEAM (THE SUM SIGNAL). FOR COMPLETENESS, A SCHEMATIC FIBER OPTICAL RECEIVER (NOT PROPOSED HERE) WHICH AFTER AMPLIFICATION DERIVES AN ERROR SIGNAL FROM THESE SUM AND DIFFERENCE SIGNALS IS DESCRIBED. WE PROPOSE TO: DESIGN A PLANAR INTEGRATED-OPTIC SLAB-COUPLER FOR A 2-DIMENSIONAL LIDAR FEED SYSTEM; SUPERVISE FABRICATION AND EVALUATION OF THE APPROXIMATE ACTUAL REALIZATION OF THIS DESIGN; COMPUTE PERFORMANCE PARAMETERS OF THE ACTUAL FEED COMPONENT; DEVELOP AND CARRY OUT TESTS TO VERIFY THE PERFORMANCE OF THE FEED COMPONENT.

APA OPTICS INC  
2950 NE 84TH LANE  
BLAINE, MN 55432  
DR A K JAIN  
TITLE:

AF

\$ 49,000

TRANSMISSION HOLOGRAPHIC RELAY LENS FOR AIRCRAFT HEAD UP DISPLAY  
T 126 OFFICE: AFWAL/FI

THE OBJECTIVE OF THE PROPOSED EFFORT IS TO REDUCE THE SIZE, WEIGHT, AND COST OF THE RELAY OPTICS OF THE AIRCRAFT HEAD UP DISPLAY (HUD), BY REPLACING IT WITH TRANSMISSION HOLOGRAPHIC LENSES. HOLOGRAPHIC LENSES ARE VERY LIGHT AND CAN BE MANUFACTURED AT VERY LOW COSTS. APPLICATIONS OF HOLOGRAPHIC LENSES TO HUD WERE LIMITED IN THE PAST, DUE TO WIDE SPECTRAL BAND OF THE HUD - CATHODE RAY TUBE (CRT). HOWEVER, WITH THE DEVELOPMENT OF NARROWER SPECTRAL BAND CRTS, THE UTILIZATION OF HOLOGRAPHIC COMPONENTS HAVE BECOME VERY ATTRACTIVE. HOLOGRAPHIC COMBINERS HAVE ALREADY BEEN SHOWN AS VIABLE REPLACEMENT OF CONVENTIONAL COMBINERS TO INCREASE INSTANTANEOUS FIELD OF VIEW OF THE HUD. IN THE PROPOSED EFFORT WE PLAN TO DESIGN AND FABRICATE TRANSMISSION HOLOGRAMS TO REPLACE THE EXISTING RELAY OPTICS. WE PLAN TO MODEL HOLOGRAMS AS THIN COMPONENTS WITH EXTREMELY LARGE REFRACTIVE INDICES, AND FABRICATE THE HOLOGRAMS BY INTERFEROMETRIC RECORDING IN DICHROMATE GELATIN FOR LARGE SPACE BANDWIDTH PRODUCT AND HIGH

FISCAL YEAR 1986

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DIFFRACTION EFFICIENCY. WE WILL DESIGN HOLOGRAMS USING COMPUTER LENS DESIGN SOFTWARE PACKAGE. SUBSEQUENT TO THE FABRICATION OF THE COMPONENTS, WE WILL TEST AND ANALYZE THEIR PERFORMANCE.		

APA OPTICS INC 2950 NE 84TH LN BLAINE, MN 55432 W T BOORD TITLE: INTEGRATED OPTIC DEVICE FOR GAS SENSING T 120 OFFICE: TACOM/AMSTA	ARMY	\$ 49,993
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THE NEED FOR SENSITIVE, SELECTIVE, STABLE, AND LOW COST GAS SENSORS WHICH CAN BE USED FOR IN SITE MONITORING OF AN ENVIRONMENT HAS NEVER BEEN ADEQUATELY FULFILLED. TO MEET THE TECHNICAL CHALLENGE INVOLVED IN THE DEVELOPMENT OF GAS SENSORS, APA OPTICS WILL UTILIZE INTEGRATED OPTICS TECHNOLOGY TO IMPLEMENT INFRARED ABSORPTION SPECTROSCOPY ON A MICROSCOPIC SCALE. THE PRIMARY TECHNOLOGY ISSUE CONCERNING THE PROPOSED INTEGRATED OPTIC DEVICE FOR GAS SENSING INVOLVES DEMONSTRATING THE FEASIBILITY OF FABRICATING THE INFRARED SOURCE AND DETECTOR AS MINIATURE, INTEGRATED COMPONENTS. PHASE I PROGRAM OBJECTIVES INCLUDE THE DESIGN, FABRICATION AND EVALUATION OF THIN FILM INFRARED RADIATION SOURCE AND DETECTOR TEST STRUCTURES. THE EFFICIENCY OF THE COUPLING OF INFRARED RADIATION INTO AND OUT OF A THIN FILM WAVEGUIDE USING THE INTEGRATED INFRARED SOURCE AND DETECTOR STRUCTURES WILL ALSO BE EVALUATED.

APPLICATIONS RESEARCH CORP 330 S LUDLOW ST DAYTON, OH 45402 THOMAS V BROWN TITLE: ADA ROBUST SOFTWARE RELIABILITY DEMONSTRATION T 9 OFFICE:	SDIO	\$ 50,000
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THE OBJECTIVE OF THIS EFFORT IS TO DEMONSTRATE THE EXTENT TO WHICH CERTAIN FEATURES OF THE ADA PROGRAMMING LANGUAGE CAN BE USED TO DETECT AND HANDLE HIDDEN SOFTWARE ERRORS WHICH WOULD OTHERWISE HALT PROGRAM EXECUTION. ADA'S TYPING, EXCEPTION HANDLING, AND INTERFACE CHECKING PROVIDE THE TOOLS FOR BUILDING SUCH ROBUSTNESS INTO SOURCE

FISCAL YEAR 1986

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CODE. THE OBJECTIVE OF THIS DEMONSTRATION IS TO SHOW HOW ROBUTNESS CAN BE GENERAL ENOUGH TO DETECT AND PARTIALLY COMPENSATE FOR A WIDE RANGE OF ERRORS. THE DEMONSTRATION INCLUDES WRITING ADDITIONAL CODE INTO AN EXISTING COMPLEX ADA PROGRAM, WITH AN INDEPENDENT GROUP OF PROGRAMMERS ATTEMPTING TO INSERT SUBTLE ERRORS WHICH COULD CAUSE FAILURE.

APPLICATIONS RESEARCH CORP

AF

\$ 49,998

330 S LUDLOW ST  
DAYTON, OH 45402  
FRANK M PARROTTA  
TITLE:

THEORETICAL OPERATING PARAMETERS JAMMING OVER BATTLEFIELD (TOP JOB)  
T 264 OFFICE: BMO/MYSC

PHASE I OF THIS PROPOSAL WILL DEFINE THE PARAMETERS ATTENDANT IN THE DEVELOPMENT OF A SATELLITE JAMMING SYSTEM. THE TARGETS FOR SUCH A SYSTEM MAY BE SPACEBORNE, AIRBORNE, OR GROUND DEVICES AND THE RD SPECTRUM WILL BE THAT OF BOTH CURRENT AND UPCOMING WEAPONRY. THE FIGURE OF MERIT WILL BE THE PENETRATOR EXPOSURE AND SURVIVABILITY. THE TECHNIQUE OF SIDELobe JAMMING FROM ORBIT WILL REQUIRE CONSIDERATION OF INCREASED RECEIVER SIGNAL DENSITIES AS WELL AS ALL THE STANDARD JAMMING PARAMETERS. THE PHASE II EFFORT SHALL PROVIDE THE DATA REDUCTION AND ENGINEERING TRADEOFFS TO DETERMINE THE DEPLOYMENT, SPECTRUM, AND FEASIBILITY OF A SATELLITE SYSTEM.

APPLICATIONS RESEARCH CORP

AF

\$ 49,524

2 DAVID ST - STE F  
FT WALTON BEACH, FL 32548  
CLIFFORD H ALLEN JR  
TITLE:

ON-BOARD AIRCRAFT EMBEDDED TRAINING CAPABILITY  
T 19 OFFICE: AFATL/ASI

THIS RESEARCH WILL INVESTIGATE PERFORMANCE MEASUREMNT TECHNIQUES AND COMPUTER SIMULATION TECHNIQUES REQUIRED FOR AN ON-BOARD AIRCRAFT "EMBEDDED TRAINING" CAPABILITY APPLICABLE TO BOTH TRAINING AND MUNITION CONCEPT EVALUATION. DATA REQUIREMENTS FOR ON-BOARD SIMULATION OF THE MUNITIONS TO ACCOMPLISH SIMULATED LAUNCH, FLYOUT AND TERMINAL ENGAGEMENT WILL BE DETERMINED. AVAILABILITY OF REAL-WORLD INPUT DATA

FISCAL YEAR 1986

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FROM SELECTED SCENARIOS REQUIRED FOR EMBEDDED TRAINING WITH THE MUNITION SIMULATED WILL BE INVESTIGATED. DATA REQUIRED FOR MAN-IN-THE-LOOP TRAINING AND FEEDBACK INFORMATION ON MISSION SUCCESS WILL BE ANALYZED. THE FEASIBILITY OF INTEGRATING THE REAL-WORLD DATA WITH THAT DATA REQUIRED TO BE SIMULATED WILL BE INVESTIGATED. THE FEASIBILITY OF USING AN OPERATIONAL MUNITION ROUND AND REPLACING THE WAR-HEAT AND PROPULSION UNITS WITH THE COMPUTATIONAL HARDWARE FOR MUNITION SIMULATION (EMBEDDED TRAINING ROUND) WILL BE INVESTIGATED. THIS "EMBEDDED TRAINING ROUND" CONCEPT WILL BE COMPLETELY INVESTIGATED FOR CAPABILITY TO PROVIDE BOTH TRAINING AND MUNITION CONCEPT EVALUATIONS.

APPLICATIONS RESEARCH CORP 330 S LUDLOW ST DAYTON, OH 45402 THOMAS V BROWN TITLE: AN ADVANCED PROTOTYPING TOOL FOR HUMAN FACTORS RESEARCH T 133 OFFICE: LABCOM/HEL	ARMY	\$ 49,992
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THE OBJECTIVE OF PHASE I OF THIS PROPOSAL IS TO DETERMINE THE APPLICABILITY TO HUMAN FACTORS RESEARCH OF AN AUTOMATED SOFTWARE DESIGN TOOL. THIS TOOL, THE USE, IT METHODOLOGY, WAS DESIGNED TO FORMALIZE AND AUTOMATICALLY CHECK COMPLEX INTERACTIONS WITHIN SYSTEMS. IT PROVIDES A CAPABILITY TO PROTOTYPE AND SIMULATE WHICH IS UNMATCHED BY ANY OTHER DESIGN METHODOLOGY. SINCE USE, IT HAS ALREADY BEEN APPLIED TO SOFTWARE AND HARDWARE DESIGN, IT CAN INTEGRATE HUMAN FACTORS DESIGNS CONSISTENTLY WITHIN BROADER EQUIPMENT REQUIREMENTS.

APPLIED LOGIC SYSTEMS INC PO BOX 90 - UNIVERSITY STATION SYRACUSE, NY 13210 KENNETH A BOWEN TITLE: PC EXPERT SYSTEM/DBMS INTERFACE TOOLS T 54 OFFICE: CECOM/AMSEL	ARMY	\$ 59,983
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THIS PROPOSAL ADDRESSES A FEASIBILITY STUDY FOR A FLEXIBLE SET OF TOOLS FOR CONSTRUCTING INTERFACES BETWEEN EXPERT SYSTEMS AND COMMERCIAL DATABASE MANAGEMENT SYSTEMS (DBMSs) ON PCs. A GREAT NUMBER OF

FISCAL YEAR 1986

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MILITARY PROBLEMS SUITABLE FOR EXPERT SYSTEMS SUPPORT INVOLVE DATA WHICH IS ALREADY MAINTAINED ON PC'S USING COMMERCIALY AVAILABLE DMSS. TO BUILD THESE EXPERT SYSTEMS, INTERFACES MUST BE CONSTRUCTED BETWEEN THE EXPERT SYSTEM AND THE DBMS. CONSTRUCTION OF INDIVIDUAL INTERFACES BY HAND FOR EACH SUCH APPLICATION WOULD BE PROHIBITIVELY COSTLY. THIS SITUATION CREATES BOTH A DEMAND AND AN OPPORTUNITY TO CREATE EXPERT TOOLS FOR THE VIRTUALLY AUTOMATIC CONSTRUCTION OF INDIVIDUALIZED INTERFACES FOR EACH APPLICATION. FUNCTIONALLY, THE SYSTEM WILL ALLOW THE USER TO EASILY SPECIFY THE STRUCTURE OF THE DATABASE FILES TOGETHER WITH THE CONNECTION BETWEEN THE DATABASE RECORDS AND THE RULES AND FACTS UTILIZED BY THE EXPERT SYSTEM. THE TECHNICAL APPROACH WILL BE TO PROCESS THESE SPECIFICATIONS WITH A RULE-BASED EXPERT SYSTEM TO PRODUCE DEFINITIONS OF THE REQUIRED INTERFACES. THIS APPROACH WILL ALSO PROVIDE FOR EXPERT SYSTEMS WHICH PROCESS RAW INPUT DATA FOR INSERTION INTO THE DATABASE, AND WHICH INVOKE GRAPHICS PRESENTATION PACKAGES ON THE INSERTED DATA.

APPLIED MEASUREMENT SYSTEMS INC 567 VAUXHALL ST EXT - STE 207 WATERFORD, CT 06385 WILLIAM C ZIMMERMAN TITLE: A NARROW BEAMWIDTH ADVANCED ACOUSTIC ARRAY MEASUREMENT SYSTEM - FEASIBILITY STUDY AND CONCEPTUAL DESIGN T 155 OFFICE: NAVSEA/NUSC	NAVY	\$ 38,276
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FOR PHASE I, AMSI PROPOSES TO IDENTIFY AND ESTABLISH THE TECHNICAL FEASIBILITY OF VARIOUS ADVANCED ACOUSTIC ARRAY CONCEPTS. THREE GENERIC APPROACHES ARE CURRENTLY IDENTIFIED: 1) OPTIMIZE THE SENSOR DESIGN (I.E., DIRECTIONAL SENSORS, ETC.), 2) OPTIMIZE HYDROPHONE/ GROUP/ARRAY GEOMETRY (I.E., MULTI-APERTURES, ETC.), AND 3) IMPLEMENT SIGNAL PROCESSING TECHNIQUES (I.E., VARIOUS ANALYTIC CONTINUATION TECHNIQUES). MORE TECHNIQUES MAY RESULT FROM THE COMPREHENSIVE LITERATURE SEARCH. THE MOST VIABLE TECHNIQUE(S) WILL THEN BE COMPLETELY EVALUATED AND RESULT IN A DETAILED CONCEPTUAL DESIGN, SUPPORTED BY ANALYTIC ACOUSTIC PERFORMANCE PREDICTIONS. THE FINAL REPORT WILL DETAIL THIS DESIGN AND THE EXPECTED ACOUSTIC PERFORMANCE AND COULD BE UTILIZED TO DIRECT PROTOTYPE DEVELOPMENT, PHASE II.

APPLIED ORDNANCE TECHNOLOGY INC 9015 WOODYARD RD - STE 108 CLINTON, MD 20735 RAYMOND L BEAUREGARD TITLE: INSENSITIVE MUNITIONS SLOW COOKOFF PROTECTION CONCEPTS T 62 OFFICE: NAVSEA	NAVY	\$ 50,600
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NAVY TECHNICAL REQUIREMENTS FOR INSENSITIVE MUNITIONS, NAVSEAINST

FISCAL YEAR 1986

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8020.5, STATES THAT "BURNING" IS THE ONLY ACCEPTABLE REACTION TO THE MIL-STD-2105 SLOW COOK-OFF TEST. TYPICAL REACTIONS IN THIS TEST ARE DETONATIONS OR PARTIAL DETONATIONS. ENERGETIC MATERIALS EXPOSED TO ELEVATED TEMPERATURES, UNDERGO A SLOW CHEMICAL REACTION, FINALLY REACHING A POINT OF AUTOCATALYTIC DECOMPOSITION, RESULTING IN VERY VIOLENT REACTIONS. A GREAT DEAL OF DATA HAS BEEN GENERATED ON MUNITIONS SLOW COOK-OFF TESTED. HOWEVER, THE INFORMATION IS SCATTERED, AND NOT AVAILABLE TO MUNITION DESIGNERS, OR TO SCIENTISTS ATTEMPTING TO DEVELOP PREDICTIVE MODELS, THAT CAN LEAD TO MINIMUM REACTIONS TO THIS TYPE OF THERMAL INPUT. THE SPECIFIC OBJECTIVE OF THE PHASE I WORK IS TO OBTAIN AND CATALOGUE SLOW AND FAST COOK-OFF DATA FROM THE NAVY LABORATORIES AND CENTERS. THESE DATA WILL BE USED TO DEVELOP A PREDICTIVE MODEL TO HELP WEAPON DESIGNERS UNDERSTAND AND DESIGN MUNITIONS THAT WILL ONLY BURN RATHER DETONATE WHEN EXPOSED TO SLOW TO INTERMEDIATE THERMAL INPUT.

APPLIED PHYSICS INC 31 HIGHVIEW AVE NANUET, NY 10954 PAUL H FRISCH TITLE: INERTIAL REFERENCE SYSTEM TO MEASURE BLAST INDUCED DISPLACEMENTS T 143	ARMY	\$ 50,000
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AN INERTIAL TRACKING SYSTEM, CONSISTING OF SUBMINIATURE LINEAR ACCELEROMETERS AND RATE SENSORS USED TO QUANTIFY THE SIX DEGREE OF FREEDOM RESPONSE OF A RIGID, TEST EQUIPMENT BASED COORDINATE SYSTEM IS DESCRIBED. THIS DATA WILL BE USED TO SUPPLEMENT PRESENTLY OBTAINED PHOTOGRAPHIC INFORMATION. SENSOR REQUIREMENTS ARE OUTLINED IN DETAIL AND APPLICABILITY OF EXISTING INSTRUMENTATION PACKAGES IS DISCUSSED. ALL PROPOSED SENSORS ARE STATE-OF-THE-ART, READILY AVAILABLE, AND HAVE A LONG SUCCESSFUL HISTORY OF UTILIZATION IN BOTH HUMAN BIODYNAMIC RESPONSE RESEARCH AND ESCAPE SYSTEM AND CRASH WORTHY SEAT TESTING. AS IS THE CASE FOR THE SENSORS, THE PROPOSED DATA ACQUISITION AND STORAGE SYSTEM POSES NO RISK WHILE PROVIDING FORMIDABLE PERFORMANCE. PROTOTYPES OF THE DATA ACQUISITION AND STORAGE SYSTEM HAVE BEEN SHOWN TO BE ROBUST AND CAPABLE OF WITHSTANDING SHOCK LOADS UP TO 40G WITH 1700G/SEC ONSET RATES. THE SYSTEM HAS SUBSEQUENTLY INCORPORATED HYBRID CHIP TECHNOLOGY, PROVIDING ADDITIONAL HARDENING AND MINIATURIZATION. THE VARIABLE CUT-OFF FREQUENCY CAPABILITY, COUPLED TO THE RANGE OF PROGRAMMABLE GAIN, MAKES IT COMPATIBLE WITH



FISCAL YEAR 1986

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VIRTUALLY ANY SENSOR CONFIGURATION. CONSEQUENTLY, APPLICATION OF THIS TECHNOLOGY TO THE BLAST ENVIRONMENT POSES A LOW RISK, HIGH PAYOFF SUPPLEMENT TO THE EXISTING DATA ACQUISITION TECHNIQUES.

APPLIED RESEARCH & ENGINEERING INC 42 BURLINGTON RD BEDFORD, MA 01730 DONALD M LESKIW TITLE: BIT SLICE COMMUNICATION SYSTEM FOR MULTISTATIC RADAR APPLICATIONS T 42 OFFICE: ESD/XRCT	AF	\$ 48,398
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APPLIED RESEARCH AND ENGINEERING, INC., PROPOSES TO DEVELOP A COMMUNICATION SUBSYSTEM FOR MULTISTATIC RADAR MISSION APPLICATIONS. THE APPROACH EMPLOYS BIT-SLICE MICROPROCESSOR TECHNIQUES TO INTEGRATE THE MULTISTATIC RADAR SIGNAL AND COMMUNICATION SUBSYSTEM DATA PROCESSING FUNCTIONS TO PROVIDE LOW DATA RATES FOR SENSOR WAVEFORM INFORMATION DISTRIBUTION. THE PHASE I EFFORT WILL DEFINE AND DEVELOP THIS CONCEPT AND PERFORM COMPUTER SIMULATIONS AND NUMERICAL ANALYSES TO DEMONSTRATE THE FEASIBILITY OF THE PROPOSED BIT-SLICE MICROPROCESSOR COMMUNICATION TECHNIQUES. SPECIFIC MULTISTATIC RADAR SYSTEM CHARACTERISTICS WILL BE COORDINATED WITH THE ESD PROGRAM OFFICE. THESE WILL SUPPORT THE EVALUATION OF THE PROPOSED COMMUNICATION SUBSYSTEM CONCEPT WITH RESPECT TO SPECIFIC RADAR SYSTEM REQUIREMENTS, CHARACTERISTICS, AND SYSTEM PARAMETERS, AND PROVIDE A BASIC FOR PROCEEDING WITH A SUBSEQUENT PHASE II PROGRAM.

APPLIED RESEARCH ASSOCS INC 4917 PROFESSIONAL CT RALEIGH, NC 27609 WILLIAM C DASS TITLE: EXTENSION OF THE CIST TECHNIQUE FOR OBTAINING MATERIAL PROPERTIES IN THE 1-10 KILOBAR PRESSURE REGION T 238 OFFICE: BMO/MYSC	AF	\$ 55,165
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GEOLOGIC MATERIAL PROPERTY REQUIREMENTS FOR NUMERICAL CALCULATION OF AN EXPLOSIVE EVENT DEPEND ON SEVERAL FACTORS, INCLUDING: THE PEAK PRESSURE EXPECTED OR ACHIEVED, THE GEOMETRY OF LOADING, AND THE TYPE OF CALCULATION BEING PERFORMED. ADDITIONALLY, THE CLASS OF GEOLOGIC

FISCAL YEAR 1986

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MATERIAL INVOLVED; E.G., SAND VERSUS CLAY VERSUS ROCK, WILL DICTATE REQUIREMENTS BASED ON WHAT ARE ANTICIPATED TO BE THE IMPORTANT BEHAVIORAL PHENOMENA. CURRENT AIR FORCE REQUIREMENTS CALL FOR ACCURATE IN SITU PROPERTIES IN THE 1-10 KILOBAR PRESSURE REGION FOR SURFACE BURST LOADING IN SEVERAL DIFFERENT GEOLOGIES. THE PROPOSED EFFORT WILL INVESTIGATE HOW THE CYLINDRICAL IN SITU TEST (CIST) TECHNIQUE, CURRENTLY USED FOR OBTAINING PROPERTIES AT LESS THAN ONE-HALF KILOBAR, MAY BE EXTENDED TO HIGHER PRESSURES. THE PROPOSED METHODOLOGY IS DESCRIBED AND CALCULATED STRESSES AND MOTIONS ARE SHOWN FOR A DRY ALLUVIAL GEOLOGY. FIELDING AND INSTRUMENTATION REQUIREMENTS ARE DISCUSSED AND COMPARED WITH OTHER EXPLOSIVE IN SITU PROPERTY TEST GEOMETRIES.

APPLIED RESEARCH ASSOCS INC  
4300 SAN MATEO NE - STE A220  
ALBUQUERQUE, NM 87110  
SCOTT E BLOUIN

DNA

\$ 89,896

TITLE:

AN ELECTRIC CONE PENETROMETER FOR SOFT ROCK DEVELOPMENT

T 1 OFFICE: AM/SBIR

THERE IS A WELL ESTABLISHED NEED FOR IMPROVED MATERIAL PROPERTIES CHARACTERIZATIONS IN CONJUNCTION WITH NUCLEAR WEAPONS EFFECTS TESTS IN THE TUNNEL BED TUFFS BENEATH RAINIER MESA. SUBSTANTIALLY IMPROVED SITE CHARACTERIZATION TECHNIQUES WOULD PERMIT MORE CONFIDENT SELECTION OF INDIVIDUAL TEST SITES, BETTER ASSURANCE THAT TESTS WILL BE FULLY CONTAINED, IMPROVED PREDICTIONS AND UNDERSTANDING OF GROUND SHOCK PROPAGATION AND STRUCTURAL RESPONSE. DEVELOPMENT OF A HIGH CAPACITY CONE PENETROMETER FOR USE IN UNDERGROUND SOFT ROCK APPLICATIONS IS PROPOSED. THIS WOULD PROVIDE DETAILED PROFILES OF PENETRATION RESISTANCE AND SLEEVE FRICTION IN ANY DIRECTION AROUND AN UNDERGROUND OPENING. USING CORRELATIONS WITH LABORATORY DATA THESE PROFILES CAN BE CONVERTED TO DETAILED ESTIMATES OF ROCK STRENGTH AND DEFORMATION PROPERTIES. PHASE I OF THIS EFFORT WOULD INVOLVE DESIGN AND FABRICATION OF CRITICAL COMPONENTS OF THE SOFT ROCK PENETROMETER AND A SERIES OF FIELD TESTS TO EVALUATE COMPONENT PERFORMANCE AND TO PROOF TEST THE OVERALL CONCEPT. UNDER PHASE II, THE COMPONENT DESIGNS AND HARDWARE FROM PHASE I WOULD BE UTILIZED IN THE DESIGN AND FABRICATION OF A PROTOTYPE SOFT ROCK PENETRATOR. METHODOLOGIES FOR DETERMINING ROCK PROPERTIES FROM THE PENETROMETER PROFILES WOULD ALSO BE DEVELOPED UNDER PHASE II.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
APPLIED RESEARCH ASSOCS INC 4300 SAN MATEO NE - STE A220 ALBUQUERQUE, NM 87110 HARRY L BEWLEY TITLE: HARDENED AIRBLAST LOAD SENSOR T 3 OFFICE: AM/SBIR	DNA	\$ 69,000

A REQUIREMENT EXISTS TO ACQUIRE ACCURATE AIRBLAST LOAD DATA AT DYNAMIC PRESSURES UP TO 10 kBAR FOR LONG DURATION. THE GAGE USED TO MAKE THESE MEASUREMENTS SHOULD EXHIBIT A LINEAR AND NONHYSTERETIC TRANSFER CURVE, HAVE ADEQUATE FREQUENCY RESPONSE TO MEASURE THE PARAMETER OF INTEREST, USE EXISTING SIGNAL CONDITIONING, SHOULD BE SMALL TO AID INSTALLATION IN STRUCTURES, AND MOST IMPORTANTLY BE EXTREMELY SURVIVABLE. WE PROPOSE TO DEVELOP AN AIRBLAST SENSOR THAT WILL MEET THESE REQUIREMENTS BASED ON LOAD CELL TECHNOLOGY. THE STRAIN GAGES WILL BE MOUNTED INSIDE THE LOAD CELL FOR INCREASED RELIABILITY. ADDITIONALLY THE SENSOR WILL BE COST EFFECTIVE TO PRODUCE AND RAW ELECTRICAL DATA WILL BE EASILY CONVERTED TO ENGINEERING UNIT PLOTS.

APPLIED RESEARCH ASSOCS INC 4300 SAN MATEO NE - STE A220 ALBUQUERQUE, NM 87110 HARRY L BEWLEY TITLE: A HIGH RANGE PARTICLE VELOCITY TRANSDUCER DEVELOPMENT T 3 OFFICE: AM/SBIR	DNA	\$ 68,750
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THERE IS AN ESTABLISHED NEED FOR A SIMPLE ROBUST TRANSDUCER TO MEASURE PARTICLE VELOCITY IN SEVERE BLAST AND SHOCK ENVIRONMENTS SUCH AS NUCLEAR AND HIGH EXPLOSIVE TESTS. A GAGE CONCEPT IS PROPOSED FOR DEVELOPMENT, BASED ON THE PROVEN MEASUREMENT PRINCIPLES USED IN THE HIGHLY SUCCESSFUL DX GAGE, BUT RECONFIGURED MECHANICALLY AND ELECTRICALLY TO WITHSTAND THE HARSH SHOCK ENVIRONMENTS. THE CONCEPT RELIES ON SENSING THE RELATIVE DISPLACEMENT BETWEEN AN INERTIAL MASS, SUSPENDED IN A VISCOUS FLUID, AND ITS RIGID CASE. MUTUAL INDUCTANCE ELECTRICAL SENSING METHOD IS PROPOSED WITH THE AC CIRCUITRY ASSOCIATED WITH THE GAGE SO THAT THE GAGE OUTPUT WILL BE A DC SIGNAL.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
APPLIED RESEARCH INC PO BOX 11220 - 5025 BRADFORD BLVD HUNTSVILLE, AL 35814 LARRY Z KENNEDY TITLE: PROGRAMMABLE VIDEO RATE CORRELATOR T 174 OFFICE: NSWC/DL	NAVY	\$ 49,842

PROPOSED IS AN OPTICAL CORRELATOR OR CONVOLVER CAPABLE OF ACCEPTING RASTER SCANNED IMAGERY AT VIDEO RATES, AND CORRELATING WITH A LARGE LIBRARY OF REFERENCE IMAGES.

APPLIED TECHNOLOGIES INC 6395 GUNPARK DR - UNIT E BOULDER, CO 80301 W R DAGLE TITLE: ULTRASONIC JET FUEL VAPOR SENSOR T 125 OFFICE: AFWAL/FI	AF	\$ 48,941
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A SELF-CONTAINED, ULTRASONIC ULLAGE SPACE COMPOSITION DETECTOR BASED ON THE SPEED OF SOUND OF THE CONTAINED ATMOSPHERE IS A FEASIBLE METHOD OF MEASURING THE CHANGE IN THE RATIO OF AIR TO JET FUEL VAPOR. THIS DETECTOR WOULD BE USED TO MONITOR THE COMPOSITION OF THE ATMOSPHERE CONTAINED IN THE ULLAGE SPACE OF FUEL TANK SPECIMENS. FOR EVERY MIXTURE OF AIR AND JET FUEL, A SPECIFIC SPEED OF SOUND WILL EXIST. A SPECIFIC MIXTURE OF AIR AND JET FUEL CAN BE REPRODUCED BY MEASURING THE SPEED OF SOUND OF THIS MIXTURE. WITH ADEQUATE TEST DATA ON THE EXPLOSIVE MIXTURES OF AIR AND THE FUEL, A DETERMINATION OF THE CHANGE IN RATIOS OF THE AIR AND JET FUEL COULD BE DEDUCED.

APPLIED TECHNOLOGY ASSOCS INC PO BOX 19434 ORLANDO, FL 32814 DR ROBERT CAVALLERI TITLE: TWO PHASE HEAT PUMP EVALUATION FOR SPACECRAFT HEAT REJECTION T 5 OFFICE:	SDIO	\$ 49,640
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FUTURE SPACECRAFT HEAT REJECTION SYSTEMS WILL BE REQUIRED TO

FISCAL YEAR 1986

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DISSIPATE LARGER AMOUNTS OF HEAT THAN CURRENT SYSTEMS. EXISTING SYSTEMS RELY QUITE HEAVILY ON HEAT PIPES AND A CIRCULATING LIQUID FLUID LOOP. USE OF A TWO PHASE VAPOR CYCLE SYSTEM OFFERS THE POTENTIAL OF INCREASED HEAT REJECTION CAPACITY WITH INCREASED RADIATOR SPECIFIC HEAT REJECTION FLUXES. THE EVALUATION OF LOW VAPOR PRESSURE TWO PHASE HEAT PUMP SYSTEMS IS PROPOSED. THE OBJECTIVE OF THE PROPOSED WORK IS TO INVESTIGATE VAPOR CYCLE SYSTEM PARAMETERS SUCH AS DIS-PLACEMENT, WORKING FLUID, PRESSURE, ETC. AND DETERMINE THEIR IMPACT ON SYSTEM HEAT REJECTION CAPACITY. THE SYSTEM OR SYSTEMS WITH THE OPTIMUM PERFORMANCE WILL BE SELECTED AND COMPONENT REQUIREMENTS FOR THE SELECTED SYSTEM(S) WILL BE DEFINED.

APPLIED TECHNOLOGY ASSOCS INC PO BOX 9154 ALBUQUERQUE, NM 87119 DR A ERTEZA TITLE: PHASED ARRAY IMAGING IN PARTIALLY COHERENT LIGHT T 83 OFFICE: AFWL/PRC	AF	\$ 41,600
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THE COMBINED REQUIREMENTS FOR HIGH SPATIAL RESOLUTION AND HIGH SIGNAL-TO-NOISE RATIO HAVE LED MANY RECENT TRACKING SYSTEMS ANALYSTS TO CONSIDERATIVE TRACKERS IMPLEMENTED WITH PHASED ARRAY OPTICS. THE PHASED ARRAY OVERCOMES THE TECHNOLOGY LIMITS ON APERTURE SIZE WHILE THE LASER SOURCES PROVIDE A DETECTABLE TARGET RETURN. THE PHASED ARRAY IMAGER HAS BEEN MODELLED FOR BOTH NON-COHERENT AND FULLY COHERENT CASES. THE ACTUAL TARGET RETURN, HOWEVER, WILL BE THE INTERMEDIATE, PARTIALLY COHERENT CASE. THIS PROPOSAL WILL EXTEND OUR PREVIOUS WORK IN COHERENT AND NON-COHERENT IMAGING WITH PHASED ARRAYS TO INCLUDE A THEORETICAL MODEL FOR THE PARTIALLY COHERENT CASE, INCLUDING BOTH GLOBAL AND LOCAL (SUBAPERTURE) ABER-RATIONS. THE MODEL WILL BE IMPLEMENTED IN AN IMAGING ANALYSIS SOFTWARE SYSTEM AND INITIAL PARAMETER SENSITIVITY ANALYSIS PERFORMED. COMPARISON OF THE NON-COHERENT, COHERENT, AND PARTIALLY COHERENT CASES WILL BE MADE.

APPLIED TECHNOLOGY ASSOCS INC 1900 RANDOLPH SE ALBUQUERQUE, NM 87106 MICHAEL R JAMES TITLE: CRAY NASTRAN TO ARCCS VAX PATRAN TRANSLATORS T 85 OFFICE: AFWL/PRC	AF	\$ 48,822
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THE CRAY-1S HAS NOT BEEN ABLE TO PRODUCE TRANSFERABLE FILES FOR THE

FISCAL YEAR 1986

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VAX 11/782 AT AFWL. FILES GENERATED IN NASTRAN ON THE CRAY ARE REQUIRED FOR POST-PROCESSING WITH PATRAN ON THE VAX. NEW AND INNOVATIVE TECHNIQUES FOR FILE TRANSFER WILL BE INVESTIGATED. A USER FRIENDLY PROCEDURE WILL BE CREATED ALLOWING ANALYSTS TO USE NASTRAN AND PATRAN WITHOUT A THOROUGH KNOWLEDGE OF EITHER MACHINE.

APPLIED TECHNOLOGY ASSOCS INC PO BOX 19434 ORLANDO, FL 32814 ROBERT CAVALLERI TITLE: BASE DRAG REDUCTION EVALUATION USING ANGLED INJECTION T 151 OFFICE: LABCOM/BRL	ARMY	\$ 49,797
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BASE DRAG ADVERSELY IMPACTS PROJECTILE RANGE. REDUCTION OF BASE DRAG CAN LEAD TO IMPROVED PROJECTILE RANGE. THERE ARE SEVERAL APPROACHES THAT CAN POTENTIALLY BE EMPLOYED TO DECREASE BASE DRAG SUCH AS BASE BLEED AND EXTERNAL BURNING. A COMBINATION OF THESE CONCEPTS WILL BE ANALYZED USING AN UNSTEADY NAVIER STOKES COMPUTER CODE. THESE TYPE OF CODES HAVE BEEN USED PREVIOUSLY TO ANALYZE THE FLOW FIELD IN BASE REGIONS WITH INJECTION. MOST OF THIS PREVIOUS WORK CONCERNING PROJECTILE DRAG REDUCTION EMPLOYED INJECTION OF AIR NEAR THE PROJECTILE BASE CENTERLINE. THE PROPOSED EFFORT WOULD 1) INVESTIGATE THE USE OF FOREIGN SPECIE INJECTION SUCH AS HELIUM, CARBON DIOXIDE OR SOLID PROPELLANT EXHAUST PRODUCTS AND 2) THE EFFECT OF ANGLED INJECTION NEAR THE PROJECTILE BASE OUTER DIAMETER. THE APPLICATION OF THIS TYPE OF COMPUTER CODE WOULD ALLOW FOR RAPID AND RELIABLE SCREENING AND OPTIMIZATION OF LOW BASE DRAG CONCEPTS. THE END RESULT WOULD BE DEVELOPMENT OF PROJECTILE CONFIGURATION GUIDELINES FOR OBTAINING INCREASED RANGE.

APPLIED TECHNOLOGY ASSOCS INC 1900 RANDOLPH RD SE ALBUQUERQUE, NM 87106 DR ROBERT B ASHER TITLE: TARGET PREDICTION ALGORITHMS AND IMPLEMENTATION T 19 OFFICE: ARDC/SMCAR	ARMY	\$ 48,274
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THE INTENT OF THIS WORK IS TO DEVELOP AN ADVANCED ESTIMATED

FISCAL YEAR 1986

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ALGORITHM FOR MANEUVERING TARGET STATE ESTIMATION AND PREDICTION FOR FIRE CONTROL AND TO DEVELOP A DESIGN OF A VHSIC SYSTOLIC ARRAY FOR IMPLEMENTATION OF THE ALGORITHM. THE DESIGN OF THE ALGORITHM WILL CONSIDER MANEUVERING TARGETS INCLUDING AIRCRAFT AND HELICOPTERS. IT WILL INCLUDE THE USE OF ADVANCED SENSOR INFORMATION SUCH AS AN IMAGERY SENSOR WITH PATTERN RECOGNITION TO DETERMINE ORIENTATION AND FRAME TO FRAME DIFFERENCING TO OBTAIN MANEUVER INFORMATION. THE VHSIC SYSTOLIC ARRAY WILL BE DESIGNED TO THE VARIABLE LEVEL. THIS WILL INCLUDE PROGRAM TRANSFORMATIONS TO MINIMIZE DATA DEPENDENCIES. COMMERCIAL APPLICATIONS: FAA TRACKING OF AIRCRAFT IS A COMMERCIAL APPLICATION OF THIS WORK.

APTECH ENGINEERING SERVICES INC

AF

\$ 49,917

795 SAN ANTONIO RD  
PALO ALTO, CA 94303  
RUSSELL C CIPOLLA

## TITLE:

STRESS INTENSITY FACTORS FOR CRACKING METAL STRUCTURES UNDER  
RAPID THERMAL LOADING

T 136

OFFICE: AFWAL/FI

FRACTURE MECHANICS LIFE PREDICTIONS REQUIRE THE DETERMINATION OF CRACK TIP STRESS INTENSITY FACTORS FOR USE IN STRUCTURAL RELIABILITY ASSESSMENTS. STRESSES IN METALLIC COMPONENTS RESULTING FROM RAPID THERMAL PULSING CAN BE HIGHLY COMPLEX AND SEVERE STRESS GRADIENTS OF A TENSILE AND COMPRESSIVE NATURE WILL OCCUR. IT IS PROPOSED HEREIN THAT A WEIGHT OR INFLUENCE FUNCTION METHOD BE DEVELOPED BECAUSE OF ITS EFFICIENCY TO SOLVE SUCH PROBLEMS. THE USE OF INFLUENCE FUNCTIONS WILL AVOID THE UNNECESSARY DISSIPATION OF RESOURCES WHEN REPETITIVE STRESS INTENSITY FACTOR CALCULATIONS ARE REQUIRED, SUCH AS IN FATIGUE CRACK GROWTH ANALYSES OR IN MONTE CARLO SIMULATIONS. A MAJOR BENEFIT OF THIS PROJECT WILL BE A COMPUTER PROGRAM THAT WILL EXECUTE ON A DESKTOP MICROCOMPUTER SO THAT THE TECHNIQUE CAN BE EASILY USED BY ENGINEERS.

APTEK INC

SDIO

\$ 69,501

2862 S CURCKE - STE 346  
COLORADO SPRINGS, CO 80906  
BRETT A LEWIS

## TITLE:

LETHALITY ASSESSMENTS USING ARTIFICIAL INTELLIGENCE TECHNIQUES

T 8

OFFICE:

CURRENTLY, LETHALITY ASSESSMENT DO NOT USE ARTIFICIAL INTELLIGENCE

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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<p>TECHNIQUES. THE GOAL OF THIS PHASE ONE PROPOSAL IS TO BUILD A DEMONSTRATABLE KNOWLEDGE SUPPORT SYSTEM TO ASSIST LETHALITY ANALYSTS AND SYSTEM ARCHITECTS IN MAKING LETHALITY ASSESSMENTS. SPECIFICALLY, WE WILL BUILD A SYSTEM INCORPORATING A TARGET/WEAPON DESCRIPTION AND PROBABILISTIC METHODS THAT WILL PROVE THE FEASIBILITY OF USING ARTIFICIAL INTELLIGENCE TECHNIQUES. WE WILL USE THE FRAMES REPRESENTATION TO DESCRIBE THE TARGET/WEAPON DATABASE. A CONTROL STRUCTURE WILL BE WRITTEN TO ASSIST THE LETHALITY ANALYST OR SYSTEM ARCHITECT IN MAKING LETHALITY ASSESSMENTS. A SIMPLE ENGLISH INTERFACE WILL BE ATTACHED TO THE CONTROL STRUCTURE SO THAT PERSONS NOT FAMILIAR WITH LETHALITY METHODS MAY MAKE ASSESSMENTS. THE RESULTS WILL BE PRESENTED IN GRAPHICAL FORM SO THAT INTERPRETATION OF RESULTS WILL BE EASY AND QUICK. IT IS PLANNED THAT THIS PROGRAM WILL BE DEMONSTRATED TO A SDIO REPRESENTATIVE AT THE END OF THE PHASE ONE STUDY.</p>		

APTEK INC 2862 S CIRCLE DR - STE 346 COLORADO SPRINGS, CO 80906 MARK D LANDON TITLE: AN INTERACTIVE OPTIMIZATION-BASED COMPUTER GRAPHICS SOFTWARE PACKAGE	AF	\$ 65,306
T 32	OFFICE: AD/XRCD	

THE OVERALL GOAL OF THIS STUDY WILL BE TO DEVELOP AN INTERACTIVE, OPTIMIZATION-BASED, COMPUTER GRAPHICS SOFTWARE PACKAGE FOR THE DETERMINATION OF THE OPTIMAL PHYSICAL FIT OF OBJECTS (I.E. WEAPONS, SUBMUNITIONS, ETC...) INTO CONTAINERS (I.E. AIRCRAFT, MISSILE DISPENSERS, TEC...). THIS PACKAGE WILL HAVE 1) A GEOMETRIC MODELER FOR THE CREATION OF THE GEOMETRIC DESCRIPTION, 2) A DESIGN DEFINITION ROUTINE FOR THE LAYOUT OF THE INITIAL DESIGN, 3) AN OPTIMIZATION ROUTINE TO OPTIMIZE THE SPATIAL FIT AND, 4) A GRAPHIC DISPLAY OF ALL INTERMEDIATE AND FINAL RESULTS. THIS STUDY WILL ALSO INCLUDE 1) A SURVEY OF THE EXISTING STATE-OF-THE-ART IN OPTIMIZATION TECHNIQUES, 2) THE STUDY OF THE FEASIBILITY OF REFORMATTING THE EXISTING GEOMETRICAL DATA BASES OF AIRCRAFT, WEAPONS, RACKS, RAILS AND SUBMUNITIONS, AND 3) THE STUDY OF THE FEASIBILITY OF REFORMATTING THE OUTPUT DATA FROM THE GEOMETRICAL DATABASES FOR USE IN CERTAIN AERODYNAMIC AND RADAR PREDICTION CODES.



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
APTEK INC 2862 S CIRCLE DR - STE 346 COLORADO SPRINGS, CO 80906 THOMAS F V MEAGHER TITLE: DATA CHANNEL IDENTIFIER SYSTEM T 3 OFFICE: AM/SBIR	DNA	\$ 63,256

THIS ACTIVITY WILL DEVELOP AND DEMONSTRATE A METHOD TO SUPERIMPOSE A SIGNAL ON DATA CHANNELS WHICH WILL IDENTIFY THE PARTICULAR DATA CHANNEL. THE SIGNAL WILL BE GENERATED AS A BINARY CODE. INCLUDED WILL BE THE DESIGN, DEVELOPMENT AND TESTING OF ONE OR MORE PROTOTYPE CHANNEL IDENTIFIER SYSTEM(S) TO INTERFACE WITH REPRESENTATIVE DATA ACQUISITION SYSTEM(S). PRODUCTION CONFIGURATION AND COST INFORMATION WILL ALSO BE PRODUCED.

ARBUS INC 2820 W CHARLESTON - C-23-7 LAS VEGAS, NV 89102 ANTHONY SWANIC TITLE: FUZE CONTACT SENSING TRANSDUCER T 134 OFFICE: NWC/NAVSEA	NAVY	\$ 49,337
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THIS PROPOSAL DESCRIBES THE PHASE I DEVELOPMENT WORK FOR A DUAL OUTPUT, "FAIL-SAFE" FIBER OPTIC FUZE CONTACT TRANSDUCER FOR USE IN AIRBORNE MISSILE APPLICATIONS. THE SENSOR WOULD EXPLOIT THE SENSITIVITY OF SPECIALIZED OPTICAL FIBERS TO MICROBENDING: THIS PHENOMENON WOULD BE USED TO DETECT PHYSICAL DEFORMATION OF A MISSILE SKIN. THE OBJECTIVES OF THE PHASE I EFFORT INCLUDE RESEARCHING AND IDENTIFYING OPTICAL FIBERS, FIBER COATINGS, AND COUPLING METHODS WHICH ARE CAPABLE OF PROVIDING SUITABLE SENSITIVITY AND SURVIVING IN-FLIGHT CONDITIONS. CANDIDATE DESIGNS FOR THESE OPTICAL COMPONENTS WOULD BE TESTED AND EVALUATED TO ESTABLISH SPECIFICATIONS FOR A PROTOTYPE SYSTEM.

ARCHITECTURAL ENERGY CORP 8753 YATES DR - STE 105 WESTMINSTER, CO 80030 DONALD J FREY TITLE: ACCEPTANCE TEST CONCEPTS FOR MECHANICAL SYSTEMS T 200 OFFICE: CERL/COE	ARMY	\$ 47,617
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THE OBJECTIVE OF THE PROPOSED PROJECT IS TO DEVELOP A COMPREHENSIVE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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ACCEPTANCE TEST PROCEDURE THAT DETERMINES WHETHER AIR DISTRIBUTION SYSTEMS IN NEW BUILDINGS ARE INSTALLED PROPERLY AND OPERATING IN AN ENERGY EFFICIENT MANNER. THE APPROCH IS TO MEASURE CRITICAL ENERGY, FLOW, PRESSURE AND TEMPERATURE PARAMETERS AND TO COMPARE THESE RESULTS WITH EXPECTED VALUES FROM DESIGN CALCULATIONS AND ENGINEERING TEST DATA SUPPLIED BY THE DESIGN ENGINEER. MEASUREMENT TECHNIQUES WILL BE ASSESSED TO MAXIMIZE THE ACCURACY OF THE PROCEDURES WHILE MAKING THEM AFFORDABLE AND AS SIMPLE AS POSSIBLE TO IMPLEMENT. THE PROCEDURES ARE EXPECTED TO PROVIDE EMPIRICAL MEANS FOR MECHANICAL SYSTEMS ACCEPTANCE AND TO DIAGNOSE PROBLEMS WITH DESIGN, EQUIPMENT, AND INSTALLATION.

ARD CORP 5457 TWIN KNOLLS RD - STE 400 COLUMBIA, MD 21045 PAUL G BANIKIOTES TITLE: CAREER INFORMATION AND GUIDANCE SYSTEMS TO ENHANCE RECRUITMENT AND RETENTION OF ROTC CADETS FOR ARMY CAREERS T 223                      OFFICE: ARI/PERI	ARMY	\$                      0
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CAREER INFORMATION AND GUIDANCE SYSTEMS ARE ESPECIALLY IMPORTANT IN AFFECTING THE PERCEPTIONS OF CAREERS AND DECISIONS INDIVIDUALS MAKE REGARDING THE CAREER DIRECTIONS THAT THEY PURSUE. THE POSITIVE PERCEPTION OF A CAREER AS AN ARMY OFFICER CAN GREATLY ENHANCE THE POSSIBILITIES OF ATTRACTING AND RETAINING OUR MOST OUTSTANDING AND CAPABLE YOUTH TO THE ROTC PROGRAM. THE PROPOSED EFFORT INVESTIGATES THE RELATIONSHIP BETWEEN NUMEROUS CAREER FACTORS AND THE PERCEPTIONS AND ATTITUDES OF A CAREER AS AN ARMY OFFICER. CAREER INFORMATION POSSESSED AND DESIRED AS WELL AS THE CREDIBILITY OF SOURCES AND PREFERRED METHODS OF PRESENTATION ARE ASSESSED USING ROTC AND NON-ROTC COLLEGE STUDENTS AND COLLEGE BOUND HIGH SCHOOL SENIORS WHO CHOOSE AND DO NOT CHOOSE TO PARTICIPATE IN ROTC. INSTRUMENTATION AND METHODOLOGY WILL BE DEVELOPED TO PERMIT INVESTIGATION OF CAREER VARIABLES AT PERIODIC INTERVALS IN ORDER TO EXAMINE CHANGING ATTITUDES AND PERCEPTIONS TOWARD THE MILITARY. THIS WILL EVENTUALLY ALLOW FOR THE DEVELOPMENT OF CAREER INFORMATION MATERIALS FOR RECRUITING STUDENTS AND THE DEVELOPMENT OF CAREER GUIDANCE SYSTEMS FOR COUNSELING ROTC CADETS.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
ARDES ENTERPRISES 22 BLOOMER RD RIDGEFIELD, CT 06877 DR RICHARD D SCHILE TITLE: NOVEL COMPOSITE FILAMENT FOR HIGH STRENGTH HIGHLY DAMPED COMPOSITE STRUCTURES T 11 OFFICE:	SDIO	\$ 74,260

FATIGUE RESISTANT, METAL MATRIX COMPOSITE MATERIALS ARE NEEDED FOR SPACE STRUCTURES WHICH POSSESS ORDER OF MAGNITUDE IMPROVEMENTS IN PASSIVE STRUCTURAL DAMPING. A NOVEL CONCEPT INVOLVING A COMPOSITE FILAMENT IS PROPOSED IN WHICH THE FILAMENT PROVIDES THE COMPOSITE STRENGTH AND STIFFNESS AS WELL AS A SOURCE OF VIBRATION ENERGY DISSIPATION. THE PROPOSED PROGRAM INVOLVES PREPARATION OF SILICON CARBIDE FILAMENTS OF APPROXIMATELY 5.6 MIL DIAMETER BY THE CHEMICAL VAPOR DEPOSITION PROCESS ON A MODIFIED CARBON SUBSTRATE AND EXPERIMENTAL DETERMINATION OF STRENGTH AND DAMPING CAPACITY.

ARIAS RESEARCH ASSOCS INC 9241 CORD AVE DOWNEY, CA 90240 JEFFREY L ARIAS TITLE: ELECTRICALLY-ACTIVATED AQUEOUS-ELECTROLYTE RESERVE BATTERY T 262 OFFICE: BMO/MYSC	AF	\$ 49,500
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THE FEASIBILITY OF A SELAED AQUEOUS ELECTROLYTE BATTERY FOR MISSILE WARHEAD APPLICATION IS INVESTIGATED. THE PROBLEM OF SELF-DISCHARGE IS APPROACHED BY STORING THE ELECTROLYTE SEPARATELY AND TRANSFERRING TO CELLS UPON ELECTRIC ACTIVATION. HIGH VOLUMETRIC POWER DENSITY IS ACHIEVED BY THIN SPIRAL-WRAP PLATES. DETAILS OF ELECTROLYTE CONFINEMENT AND TRANSFER, AND OTHER FEATURES OF CONSTRUCTION ARE PRESENTED.

ARKADY ASSOCS PO BOX 1960 GARDEN GROVE, CA 92642 ELMER J DRYER TITLE: AN INNOVATIVE KNOWLEDGE BASED EW POWER MANAGEMENT SYSTEM T 61 OFFICE: CECOM/AMSEL	ARMY	\$ 48,898
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THIS PROPOSAL PROVIDES AN INNOVATIVE APPROACH TO COUNTERING

FISCAL YEAR 1986

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PARAMETER AGILE RADAR SYSTEMS USING A UNIQUE METHOD FOR SIGNAL TRACKING AND A KNOWLEDGE BASED SIGNAL FUNCTION RECOGNITION SYSTEM.

ASSOCIATED CORP 19 SPRING ST NEWPORT, RI 02840 E W BAER	ARMY	\$ 50,000
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TITLE:  
AN EXPERT NATURAL LANGUAGE BASED AUTOMATED SOFTWARE REQUIREMENTS SPECIFICATION ANALYZER  
T 16 OFFICE: ARDC/SMCAR

THE ASSOCIATED CORPORATION PROPOSES TO INVESTIGATE AN INTERRELATED THREE-PART KNOWLEDGE BASED SYSTEM HAVING A NATURAL LANGUAGE INTERPRETER, AN EXPERT SYSTEM ANALYZER AND A NATURAL LANGUAGE GENERATOR. TECHNIQUES USING A LEXICALLY/SEMANTICALLY/FUNCTIONALLY FOCUSED DICTIONARY, PARSER, ANALYSER WHICH TAKES ADVANTAGE OF REPETITIVE LEXICAL STRINGS ARE PROPOSED FOR NATURAL LANGUAGE PROCESSING. INVESTIGATION OF A FRAME BASED STRUCTURE OF INTERRELATED MODULES, OPEN ENDED KNOWLEDGE BASE AND INTERACTIVE EXPERT SYSTEM ANALYZER IS PROPOSED FOR THE AUTOMATED SOFTWARE REQUIREMENTS SPECIFICATION ANALYZER (ASRSA) SYSTEM ARCHITECTURE. THIS FIVE PART STUDY-EXPLORATORY DEVELOPMENT PROGRAM WILL: a) IDENTIFY THE ASRSA SYSTEM FUNCTIONAL REQUIREMENTS AND DEVELOP THE SYSTEM ARCHITECTURE; b) DEFINE AND ELICIT THE METHODOLOGY AND HEURISTIC/PROCEDURAL RULES USED BY EXPERT ANALYSTS; c) CONDUCT INITIAL EXPLORATORY DEVELOPMENT OF SELECTED HIGH RISK AREAS; d) CONDUCT A VENDOR SURVEY OF OPTICAL CHARACTER READERS (OCRS); AND e) PREPARE FUNCTIONAL AND PERFORMANCE SPECIFICATIONS TO BE USED FOR PHASE II DEVELOPMENT OF AN EXPERT ASRSA SYSTEM.

ASSOCIATES & FERREN PO BOX 609 - WAINSCOTT NW RD WAINSCOTT, NY 11975 CHARLES HARRISON	NAVY	\$ 49,002
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TITLE:  
REAL TIME 3-D COMPUTER VISION  
T 119 OFFICE: NSWC

THE PURPOSE OF THIS DEVELOPMENT PROPOSAL IS TO DEMONSTRATE HIGH SPEED RANGING AND CLASSIFICATION OF OBJECTS WITH A VERSION OF A&F'S

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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PROPRIETARY 3D VISION SYSTEM. THIS SYSTEM HAS ALREADY DEMONSTRATED TARGET CLASSIFICATION AND RANGING IN REALISTIC ENVIRONMENTS IN WORK SUPPORTED BY NSWC. THE EMPHASIS OF THIS PROJECT IS TO INCREASE THE SPEED OF THE SYSTEM FROM IT'S PRESENT LEVEL.

ASTRO INNOVATIONS INC  
290 PHEASANT RUN  
FEASTERVILLE, PA 19047  
JOSEPH BEDNARZ

SDIO \$ 53,517

TITLE:  
LIQUID EXOATMOSPHERIC COUNTERMEASURES  
T 2 OFFICE:

LIQUIDS RELEASED INTO SPACE OFFER HIGH POTENTIAL AS COUNTERMEASURE AGAINST SDI DEFENSIVE SYSTEMS DESIGNED TO ENGAGE BALLISTIC MISSILES DURING THEIR EXOATMOSPHERIC FLIGHT PHASES. THE COUNTERMEASURE POTENTIAL INCLUDES THE ABILITY TO THWART DETECTION AND DISCRIMINATION SYSTEMS, REDUCE DEW EFFECTIVENESS, AND DEFEAT KEW ATTACK. STREAMS AND SPRAYS OF SELECT LIQUIDS WOULD BE USED TO MASK THE DEPLOYMENT OF RVs AND PENETRATION AIDS. THE RESULTING CLOUD OF DROPLETS AND ICE PARTICLES IS EXPECTED TO ABSORB, REFLECT AND SCATTER INCIDENT DEW RADIATIONS. KEW PROJECTILES WHICH TRAVERSE THIS CLOUD WOULD EXPERIENCE DAMAGE TO SENSORS, ELECTRONICS AND PROPULSION SUBSYSTEMS. SUCCESS IN ANY ONE OF THESE AREAS WOULD SIGNIFICANTLY IMPACT THE COMPOSITION AND STRUCTURE OF AN SDI DEFENSIVE SYSTEM. PHASE I WILL INVESTIGATE THE TECHNICAL AND OPERATIONAL PRACTICALITY ISSUES NECESSARY TO DETERMINE CONCEPT FEASIBILITY. THE PRINCIPAL AREA OF CONCERN IS THE ESTABLISHMENT OF EMPIRICAL RELATIONSHIPS GOVERNING THE BEHAVIOR OF LIQUIDS RELEASED INTO A SPACE ENVIRONMENT. THE INTERACTION OF THE RELEASED LIQUIDS ON THE OPERATIONAL PERFORMANCE OF THE PBV WILL ALSO BE ADDRESSED. RESULTS OF PHASE I WILL FORM THE BASIS FOR AN EXTENSIVE GROUND AND FLIGHT TEST PROGRAM DURING PHASE II.

ASTRON CORP  
929 W BROAD ST - STE 249  
FALLS CHURCH, VA 22046  
JOSEPH R JAHODA

NAVY \$ 49,810

TITLE:  
LIGHTWEIGHT BROADBAND SHIPBOARD HIGH FREQUENCY ANTENNA  
T 34 OFFICE: SPAWAR

A SERIES OF BROADBAND HF ANTENNA STRUCTURES WAS ANALYZED FOR

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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POTENTIAL SHIPBOARD APPLICATIONS. INCLUDED WERE ALTSHULTER INSERTIONS, DIELECTRIC LOADING, MULTIPLE REACTIVE INSERTIONS, ACTIVE TRANSMIT ANTENNA, AND MULTIPLE TRANSMISSION LINES. OBJECTIVES INCLUDE 3 TO 1 MAXIMUM VSWR OVER THE 2 TO 30 MHz BAND, OMNI-DIRECTIONAL, MEET SEVERE ENVIRONMENTAL SPECIFICATIONS, HIGH EFFICIENCY, AND OPERATE WITH 1 KILOWATT RF INPUT. A SIMILAR ANALYSES WAS MADE FOR A BROADBAND RECEIVING ANTENNA. SEVERAL ACTIVE DESIGNS WERE CONSIDERED INCLUDING SOLID STATE AND VACUUM TUBE VERSIONS.

ASTRON RESEARCH & ENGINEERING 2028 OLD MIDDLEFIELD WAY MOUNTAIN VIEW, CA 94043 CHARLES POWARS TITLE: HIGH PERFORMANCE ELECTROMAGNETIC RAIL GUN INSULATORS T 2 OFFICE:	SDIO	\$ 74,228
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RAIL INSULATOR MATERIALS PERFORMANCE IS CRITICAL TO THE VIABILITY OF ELECTROMAGNETIC RAIL GUNS AS KINETIC ENERGY WEAPONS FOR SDI MISSIONS. THE INSULATORS ARE EXPOSED TO A SEVERE THERMAL, MECHANICAL, AND ELECTRICAL MULTI-SHOT ENVIRONMENT. THE OBJECTIVE OF THIS RESEARCH IS TO IDENTIFY AND DEMONSTRATE RAIL INSULATOR MATERIALS WHICH REMAIN DIELECTRIC IN THIS ENVIRONMENT WITHOUT SIGNIFICANT ABLATION, FRACTURE, DEFORMATION, OR OTHER DEGRADATION. PRIMARY CONSIDERATION WILL BE GIVEN TO ADVANCED CERAMICS, INCLUDING CERAMIC COMPOSITES. FRACTURE RESISTANCE IS A KEY REQUIREMENT FOR CERAMICS, AND SILICON NITRIDE IS A CANDIDATE CERAMIC MATERIAL. SECONDARY CONSIDERATION WILL BE GIVEN TO MONOLITHIC AND REINFORCED PLASTICS. ABLATION RESISTANCE IS THE KEY CONCERN FOR PLASTICS, AND GLASS FIBER REINFORCED HIGH TEMPERATURE MATRIX (EG, POLYIMIDES) COMPOSITES ARE CANDIDATES HERE. WE WILL QUANTIFY THE INSULATOR PERFORMANCE REQUIREMENTS, DEFINE AND ANALYTICALLY SCREEN CANDIDATE INSULATOR MATERIALS, AND IDENTIFY THE OPTIMUM MATERIAL AND ITS PROJECTED PERFORMANCE SUITABILITY. WE WILL FABRICATE AN INSULATOR SET FROM A CANDIDATE MATERIAL FOR TESTING IN A SINGLE-SHOT RAIL GUN.

ASTRON RESEARCH & ENGINEERING 2028 OLD MIDDLEFIELD WAY MOUNTAIN VIEW, CA 94043 JOHN F WILBY TITLE: GAS TURBINE AUGMENTER ACOUSTIC CHARACTERIZATION T 177 OFFICE: NAVAIR/NAPC	NAVY	\$ 58,657
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THE OPERATION OF GAS TURBINE AUGMENTERS CAN GENERATE INTENSE

FISCAL YEAR 1986

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DEPT

AWARDED  
AMOUNT

ACOUSTIC PRESSURES WHICH INFLUENCE THE PERFORMANCE OF THE AUGMENTER AND THE DURABILITY OF THE STRUCTURE. THESE PHENOMENA HAVE BEEN OF CONCERN FOR SEVERAL YEARS, PARTICULARLY IN THE OPERATION OF RAMJET ENGINES, AND HAVE BEEN THE SUBJECT OF SEVERAL TEST PROGRAMS. HOWEVER, THERE IS NO AVAILABLE ANALYTICAL OR EMPIRICAL MODEL OF THE GENERATING MECHANISMS THAT CAN BE USED TO EVALUATE CONCEPTS FOR REDUCING OR ELIMINATING THE PROBLEMS. THE PROPOSED OVERALL PROGRAM HAS THE OBJECTIVES OF DEVELOPING SUCH MODELS FOR AUGMENTER RUMBLE AND SCREECH, AND USING THE MODELS TO EVALUATE POTENTIAL NOISE CONTROL CONCEPTS THAT WOULD IMPROVE AUGMENTER PERFORMANCE UNDER PHASE I. THE MODELS WILL CONSIDER AXIAL AND TANGENTIAL OSCILLATIONS IN THE COMBUSTOR. AT HIGH FREQUENCIES THESE OSCILLATIONS WILL BE ASSOCIATED WITH ACOUSTIC MODES BUT THIS IS NOT NECESSARILY TRUE FOR AXIAL OSCILLATIONS. ASSUMPTIONS INTRODUCED WILL BE VALIDATED BY MEANS OF UP-TO-DATE DATA FOR ENGINE AUGMENTERS; THE DATA WILL ALSO BE USED TO VERIFY THE FINAL MODELS.

ASTRON RESEARCH AND ENGINEERING  
2028 OLD MIDDLEFIELD WAY  
MOUNTAIN VIEW, CA 94043  
JOHN H. HUNTINGTON

SDIO

\$ 76,392

TITLE:

STRUCTURAL DESIGN OF EML PROJECTILES

T 2 OFFICE:

THE STRUCTURAL INTEGRITY OF EML PROJECTILES IS A CRITICAL ISSUE FOR SYSTEMS SUCH AS SAGITTAR. IF A PROJECTILE WERE TO BREAK WITHIN THE BARREL, IT WOULD PUT THE WEAPON OUT OF COMMISSION. A SPACE-BASED EML WEAPON FOR BALLISTIC MISSILE DEFENSE MUST BE ABLE TO FIRE HUNDREDS OF ROUNDS FROM A SINGLE BARREL, OR SERIOUS ISSUES OF SYSTEM EFFECTIVENESS AND ECONOMICS WILL ARISE. EXCESSIVE ACCELERATION IS ONLY ONE OF FOUR INDEPENDENT, FIRST-ORDER MECHANISMS BY WHICH PROJECTILES ARE DAMAGED WITHIN A GUN BORE. THE OTHER THREE ARE: EXCESSIVE BASE PRESSURE, EXCESSIVELY RAPID RELEASE OF BASE PRESSURE, AND BALLOTTING. THIS PROPOSAL DEFINES A NOVEL, SYSTEMATIC APPROACH TO THE DEVELOPMENT OF QUANTITATIVE DESIGN INFORMATION THAT SHOULD PROVE USEFUL TO CONTRACTORS AND GOVERNMENT PERSONNEL WORKING ON SAGITTAR, GREMLIN, TRAILBLAZER II AND THUNDERBOLT. THE PROPOSED WORK WILL BEGIN WITH A THOROUGH SURVEY OF EXISTING ART IN PROJECTILE DESIGN. MODERN COMPUTER METHODS WILL BE USED TO DEVELOP GENERIC MODELS OF EML PROJECTILES. THE INPUT DATA REQUIRED FOR PROJECTILE DESIGN WILL BE

FISCAL YEAR 1986

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COMPLETED WITH THE QUANTIFICATION OF LOADINGS GENERATED BY EACH OF THE FOUR IDENTIFIED MECHANISMS. THE VALIDITY OF THE CONCEPT OF USING THIS APPROACH TO GENERATE DESIGN TOOLS FOR SYSTEM CONTRACTORS WILL BE EVALUATED.

ASTROSYSTEMS INC  
30 LOVETT AVE  
NEWARK, DE 19711  
JAMES B MCNEELY  
TITLE:

DARPA

\$ 49,999

MONOLITHIC GaAs LIGHT-EMITTING DIODES ON SILICON VLSI CIRCUITS  
ELEMENTS

T 13 OFFICE: DARPA

OPTOELECTRONIC SOURCES, INTEGRATED AS MONOLITHIC ELEMENTS ON SILICON VLSI CHIPS, OFFER IMPORTANT ADVANTAGES IN THE TRANSMISSION OF INFORMATION WITHIN THE CHIP OR BETWEEN CHIPS IN ADVANCED COMPUTER SYSTEMS. THE SPEED OF OPTICAL-INTEGRATED VLSI DEVICES IS EXPECTED TO BE CONSIDERABLY HIGHER THAN EQUIVALENT VLSI WITH METALLIC INTERCONNECTS, DUE TO ABSENCE OF THE RC DELAY INHERENT IN THE METALLIC CONDUCTOR SYSTEM. A KEY OPPORTUNITY, AT THIS TIME, THEREFORE, IS TO INTEGRATE GaAs LED'S ONTO SILICON VLSI CIRCUITS AND TO USE GaAs LED'S TO COMMUNICATE EITHER BY DIRECT OPTICAL INTERACTION WITH A SILICON DETECTOR, OR BY LIGHT-GUIDED OR HOLOGRAPHIC TECHNIQUES. WE PROPOSE TO DEVELOP METHODS OF NUCLEATION AND ISLAND GROWTH OF GaAs ON SINGLE CRYSTAL SILICON WAFERS THROUGH THE USE OF A NOVEL STRUCTURE WHICH MINIMIZES THE CONTACT AREA BETWEEN THE GaAs AND THE SILICON. THIS STRUCTURE WILL BE PREPARED USING SELECTIVE LIQUID-PHASE EPITAXY THROUGH VIAS IN A SILICON DIOXIDE LAYER ON THE SILICON WAFER. AN INTERMEDIATE NUCLEATION INTERLAYER WILL BE UTILIZED TO ACCOMMODATE THE LATTICE MISMATCH BETWEEN THE SILICON SUBSTRATE AND THE GaAs OVERGROWTH. DIRECT CONTACT BETWEEN THE SILICON AND GaAs WILL BE LESS THAN ONE PERCENT OF THE OVERALL AREA, WHICH WILL LIMIT STRAIN AND DISLOCATIONS WITHIN THE GaAs FILM. LIGHT-EMITTING DIODES WILL BE FABRICATED DIRECTLY ON SILICON VLSI CIRCUIT ELEMENTS, NAMELY, ON A N-MOS DRIVER. THE DEMONSTRATION OF A MONOLITHIC GaAs LED INTEGRATED ON A SILICON N-MOS DRIVER REPRESENTS A MAJOR ADVANCE IN THE PROGRESS TOWARD OPTICALLY INTERCONNECTED CIRCUITS FOR THE NEW GENERATION OF ULTRA-HIGH SPEED COMPUTER SYSTEMS.



FISCAL YEAR 1986

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ASTROSYSTEMS INC (ASTROPOWER DIV) 30 LOVETTE AVE NEWARK, DE 19711 J S CULIK TITLE: HIGH-EFFICIENCY THIN-FILM SILICON-ON-GaP SOLAR CELL FOR IMPROVED RADIATION RESISTANCE T 180 OFFICE: AFWAL/PO	AF	\$ 50,000

THE ULTIMATE HIGH-EFFICIENCY CRYSTALLINE SILICON SOLAR CELL DESIGN CONSISTS OF A THIN FILM OF ELECTRICALLY-ACTIVE SILICON EPITAXIALLY GROWN ON AN OXIDE-OVERCOATED, INFRARED-TRANSPARENT GALLIUM PHOSPHIDE (GaP) SUBSTRATE. IN ADDITION TO HIGH CONVERSION EFFICIENCY AND INTRINSIC RADIATION RESISTANCE DUE TO THE THIN ACTIVE LAYERS, THIS NOVEL DESIGN HAS SEVERAL UNIQUE PERFORMANCE ENHANCING FEATURES. THE OXIDE OVERCOATING LAYER WILL SERVE AS A DIELECTRIC BACK SURFACE REFLECTOR TO ENHANCE THE OPTICAL ABSORPTION AND WILL ALSO ELIMINATE DANGLING BONDS IN THE EPITAXIALLY OVERGROWN SILICON LAYER, EFFECTIVELY PASSIVATING THE SILICON-OXIDE INTERFACE AND REDUCING BACK SURFACE RECOMBINATION. A HETEROJUNCTION CONTACT FORMED AT THE SILICON-GaP INTERFACE THROUGH VIAS IN THE OXIDE WILL MINIMIZE BACK OHMIC CONTACT LOSSES. AND FINALLY, THE WIDE BANDGAP, INFRARED TRANSPARENT GaP SUBSTRATE WILL ALLOW LONG WAVELENGTH PHOTONS TO PASS THROUGH THE STRUCTURE WHICH WILL REDUCE THE OPERATING TEMPERATURE. IN ADDITION, SINCE THE ACTIVE DEVICE IS SILICON, DEVICE PROCESSING CAN TAKE ADVANTAGE OF STANDARD, SPACE-QUALIFIED, SILICON SOLAR CELL FABRICATION PROCEDURES. THE OBJECTIVE OF PHASE I IS TO DEMONSTRATE THE POTENTIAL OF THIS THIN-FILM SILICON SOLAR CELL STRUCTURE BY GROWING THIN EPITAXIAL LAYERS OF SILICON ON AN OXIDE-OVERCOATED GaP SUBSTRATE AND FABRICATING A SOLAR CELL THAT INCORPORATES THE IMPROVED FEATURES.

ATEAM CORP 7920 CHAMBERSBURG RD DAYTON, OH 45424 KENNETH D WILKINSON TITLE: MATE INTERFACE CONNECTOR ASSEMBLY (ICA) STANDARD T 87 OFFICE: ASD/AE	AF	\$ 49,413
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THE MATE PROGRAM OFFICE HAS REQUESTED A REVIEW OF THE MATE GENERAL

FISCAL YEAR 1986

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AMOUNT  
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PURPOSE ELECTRICAL INTERFACE CONNECTOR STANDARD TO IMPROVE THE GUIDANCE TO DEVELOP THE MATE INTERFACE CONNECTOR ASSEMBLY (ICA). THIS STUDY WILL GATHER INFORMATION, ANALYZE THE RESULTS AND PROVIDE RECOMMENDATIONS TO VERIFY THAT THE ICA WILL MEET PROJECTED AIR FORCE TESTING REQUIREMENTS IN A COST EFFECTIVE MANNER. THE FOLLOWING TECHNICAL OBJECTIVES WILL BE COMPLETED AS PART OF THE PHASE I STUDY: 1. IDENTIFY THE QUANTITY AND TYPES OF TEST SIGNALS REQUIRED TO SATISFY CURRENT AND FUTURE AIR FORCE TEST REQUIREMENTS. 2. DETERMINE IF THE MATE ICA STANDARD SHOULD INCLUDE INCREASED DIGITAL CAPABILITY. 3. DETERMINE A METHOD TO MAKE THE DIGITAL AREA OF THE ICA TRANSPORTABLE TO SUPPORT DIFFERENT LOGIC LEVELS. 4. DETERMINE IF THE MATE ICA STANDARD SHOULD PERMIT DIFFERENTIAL LINE DRIVERS AND RECEIVERS AT THE INTERFACE. 5. DETERMINE IF UNIVERSAL PIN CAPABILITIES CAN BE PROVIDED IN THE ICA. 6. DETERMINE IF PIN ELECTRONICS TECHNOLOGY CAN BE INSERTED INTO THE CURRENT MATE ICA STANDARD WITHOUT IMPACTING THE MATE OBJECTIVE TO ACHIEVE TPS INTEROPERABILITY BETWEEN MATE ICAS. 7. SURVEY ICA TECHNOLOGIES AND IDENTIFY POSSIBLE IMPROVEMENTS TO THE ICA STANDARD.

ATEAM CORP  
7920 CHAMBERSBURG RD  
DAYTON, OH 45424  
KENNETH D WILKINSON

AF

\$ 28,715

TITLE:

ELECTRO-OPTICAL UNIT TESTING

T 88

OFFICE: ASD/AE

THE FOLLOWING TECHNICAL OBJECTIVES WILL BE ACHIEVED IN THIS STUDY: 1. ASSESS THE AUTOMATIC TEST REQUIREMENTS FOR ELECTRO-OPTICAL (E/O) UNITS UNDER TEST (UUTS). 2. IDENTIFY AUTOMATIC TEST EQUIPMENT (ATE) STANDARDS FOR TESTING ELECTRO-OPTICAL UNITS UNDER TEST (UUT). 3. IDENTIFY SUITABLE MATE TESTING METHODOLOGIES AND STANDARDS FOR INTERFACING ELECTRO-OPTICAL UUTS TO THE ATE. SURVEYS OF MAJOR AIR FORCE PROGRAMS, AS WELL AS OTHER GOVERNMENT PROGRAMS, IN ALL PHASES OF DEVELOPMENT WILL BE CONDUCTED TO GATHER E/O INTERFACE REQUIREMENTS. THE SURVEY OF GOVERNMENT ORGANIZATIONS WILL ALSO REQUEST INFORMATION ON POSSIBLE E/O TESTING STANDARDS THAT HAVE BEEN APPLIED OR ARE BEING CONSIDERED. VARIOUS STANDARDS ORGANIZATIONS, SUCH AS IEEE AND ANSI, WILL BE CONTACTED TO DETERMINE IF THEY ARE WORKING ON ANY E/O TESTING STANDARDS. REPRESENTATIVE COMMERCIAL TESTING SYMPOSIA WILL BE REVIEWED. A DETAILED ANALYSIS OF COLLECTED DATA 2 WILL BE COMPLETED.

FISCAL YEAR 1986

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THE ANALYSIS WILL CONSIDER THE MATE OBJECTIVES OF SUPPORTING ELECTRO-OPTICAL PRIME SYSTEMS AT AN AFFORDABLE PRICE THROUGH LOGICAL APPLICATION OF INTERFACE STANDARDS. THE ABILITY TO SUPPORT FUTURE TECHNOLOGY IN A COST EFFECTIVE MANNER WILL ALSO BE CONSIDERED.

ATLAN-TECH INC 635 HEMBREE PKWY ROSWELL, GA 30076 JOSEPH J SHONKA TITLE: DIELECTRIC CONDUCTIVITY EFFECTS UNDER THE INFLUENCE OF IONIZING DOSE RATES T 147	NAVY	\$ 49,721
OFFICE: NWSC		

THE EFFECTS OF IONIZING RADIATION ON DIELECTRIC CONDUCTIVITY OF COMMON ELECTRONICS MATERIALS WILL BE STUDIED. FOLLOWING DEVELOPMENT OF AN ACCEPTABLE PROTOCOL, CONDUCTIVITY FOR A NUMBER OF MATERIALS WILL BE STUDIED AS A FUNCTION OF ENERGY OF THE IONIZING RADIATION, INTENSITY, TEMPERATURE AND TEMPORAL DEPENDANCE OF PHENOMENON. THESE DATA WILL BE USED TO AMEND THE PROTOCOL TO PERMIT STUDY IN SUBSEQUENT WORK OF THE PHENOMENON ON THE FULL EXTENT OF COMMON ELECTRONICS MATERIALS. A PRELIMINARY EMPIRICAL MODEL, BASED ON BOTH THEORETICAL STUDIES AND ON DATA GATHERED AS A PART OF THE PROPOSAL WILL BE DEVELOPED WHICH SHOULD PERMIT DESIGNERS TO ACCOMMODATE THIS PHENOMENON.

ATLANTIC APPLIED RESEARCH CORP 129 MIDDLESEX TURNPIKE BURLINGTON, MA 01803 FRED R KERN JR TITLE: NON-CONTACTING LINEAR DISPLACEMENT SYSTEM DEVELOPMENT T 143	AF	\$ 49,005
OFFICE: AFWAL/FI		

ATLANTIC APPLIED RESEARCH CORPORATION HAS BEEN DEVELOPING A VERY HIGH ACCURACY LASER SURFACE SHAPE MEASUREMENT SYSTEM. IT CURRENTLY HAS THE ABILITY TO SCAN A MEASUREMENT LASER BEAM IN ONE DIMENSION AND MEASURE THE POSITION OF THE SURFACE OF ALMOST ANY OBJECT IT STRIKES RELATIVE TO A REFERENCE PLANE. THIS NON CONTACT LINEAR DISPLACEMENT SENSOR PROJECT WOULD INVOLVE ADAPTING THE SCANNING MECHANISM SO THAT THE LASER BEAM WOULD BE DIRECTED ALTERNATELY AT THE PROBE AND AT THE

FISCAL YEAR 1986

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MODEL'S SURFACE TO MEASURE THE DISTANCE BETWEEN THEM. COMPUTER PROGRAMS WOULD BE DEVELOPED TO ACQUIRE AND STORE THE POSITION DATA. THE SCANNING SYSTEM, INCLUDING THE LIGHT SOURCE AND RECEIVING PHOTO DETECTOR WOULD BE LOCATED SEVERAL FEET FROM THE MODEL, OUTSIDE OF THE MACH 6 WIND TUNNEL. IT WILL OPERATE BY PASSING THE LIGHT THROUGH A WINDOW IN THE TUNNEL WALL. THUS THE HIGH INTERNAL TEMPERATURE IS NOT A PROBLEM. FOR PROBE AND MODEL SURFACES WHICH ARE DIFFUSE REFLECTING SURFACES, IT IS NOT NECESSARY TO ALIGN THE LASER BEAM NORMAL TO THE SURFACES BUT ONLY KNOW THE INCIDENCE ANGLE, SINCE THE SYSTEM USES A RANGE FINDING TECHNIQUE. A MINOR CORRECTION TO THE SPEED OF LIGHT DUE TO THE TEMPERATURE AND DENSITY OVER THE REGION BETWEEN THE PROBE AND THE MODEL MAY BE REQUIRED. THE SENSITIVITY OF THIS CORRECTION WILL BE INVESTIGATED. A DEPTH OF FIELD OF A 20 CENTIMETERS IS PRACTICAL. THE VERSATILITY OF THE SCANNING SYSTEM ALLOWS THE USE OF A SIMPLE SCANNER TO MEASURE MORE THAN ONE PROBE, IF DESIRED.

ATLANTIC APPLIED RESEARCH CORP  
129 MIDDLESEX TURNPIKE  
BURLINGTON, MA 01803  
CHARLES GEDNEY

NAVY

\$ 49,592

## TITLE:

THE EFFECT OF ANISOTROPIC COMPLIANT WALLS ON TURBULENT BOUNDARY  
LAYER FLOW NOISE

T 158

OFFICE: NAVSEA/NVSC

THE PERFORMANCE OF MANY ADVANCED UNDERWATER ACOUSTIC SENSOR SYSTEMS IS LIMITED BY UNWANTED NOISE CAUSED BY THE TURBULENT BOUNDARY LAYER (TBL). THE TBL MAY ALSO EXCITE UNWANTED NOISE AND VIBRATION (FLOW NOISE) IN A VARIETY OF MARINE AND AIRCRAFT VEHICLES. A SIGNIFICANT AMOUNT OF FLOW NOISE REDUCTION HAS BEEN REPORTED WHEN ANISOTROPIC COMPLIANT WALLS HAVE BEEN TESTED. THE PROPOSED WORK IS TO DEVELOP THE TOOLS NECESSARY TO CALCULATE AND MEASURE THE WAVEVECTOR-FREQUENCY SPECTRA (INCLUDING THE LOW-WAVENUMBER REGION) OF TBL WALL PRESSURE FLUCTUATIONS ON ANISOTROPIC COMPLIANT LAYERS. A TECHNIQUE FOR DETERMINING THE PROPERTIES OF THE COMPLIANT LAYERS WILL BE INCLUDED AS PART OF THE MEASUREMENT SYSTEM. A POSSIBLE DESIGN OF THE MEASUREMENT APPARATUS WILL BE AN EXTENSION OF AN ACOUSTIC SENSOR SYSTEM WHICH IS CURRENTLY UNDER DEVELOPMENT AT ATLANTIC APPLIED RESEARCH CORPORATION. THE APPARATUS WILL USE THE COMPLIANT LAYER AS AN INTEGRAL PART OF ITS DESIGN. THE DESIGN GOAL WILL INCLUDE THE ABILITY TO USE A WIDE VARIETY OF COMPLIANT MATERIALS (ISOTROPIC OR ANISOTROPIC), AND A

FISCAL YEAR 1986

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WAVENUMBER RANGE AND RESOLUTION SURPASSING MEASUREMENT SYSTEMS CURRENTLY AVAILABLE. THEORETICAL EFFORTS WILL BE CONCENTRATED ON EVALUATING EXPERIMENTAL RESULTS AND GUIDING EXPERIMENTAL TESTS AS WELL AS INVESTIGATING THE EFFECTS OF THE COMPLAINT LAYER ON THE TBL SPECTRUM.

ATLANTIC APPLIED RSCH CORP 129 MIDDLESEX TURNPIKE BURLINGTON, MA 01803 MICHAEL J RUDD TITLE: ACOUSTIC ARRAY T 44	ARMY	\$ 49,947
OFFICE: AVSCOM		

AN INTEGRATED ACOUSTIC ARRAY AND SIGNAL PROCESSING SYSTEM WILL BE DEVELOPED FOR THE DETECTION, TRACKING AND IDENTIFICATION OF ROTARY-WING AIRCRAFT. THE TECHNIQUE USES A RUGGED PIEZO-ELECTRIC POLYMER SENSOR AND A PROPRIETARY TELEMETRY SYSTEM. A COMMERCIALY AVAILABLE ARRAY PROCESSOR IS USED TO PERFORM THE REQUIRED SIGNAL PROCESSING.

ATLANTIS RESEARCH GP ONE INTERCONTINENTAL WY PEABODY, MA 01960 RICHARD D HEALY TITLE: SOFTWARE BIT FEASIBILITY FOR SDI APPLICATIONS T 10	SDIO	\$ 50,000
OFFICE:		

SOFTWARE FAILURES ARE SUBSTANTIALLY DIFFERENT THAN THEIR HARDWARE ANALOGUES; SOFTWARE DOESN'T BREAK OR WEAR OUT. INSTEAD, SOFTWARE FAILS TO OPERATE CORRECTLY WHEN THE OPERATIONAL ENVIRONMENT IS SUFFICIENTLY DIFFERENT FROM THE DESIGN ENVIRONMENT THAT THE SOFTWARE DESIGN NO LONGER PROVIDES ACCEPTABLE RESULTS. AS A RESULT, SUCCESSFULLY PREDICTING WHEN THE SOFTWARE IS LIKELY TO FAIL REQUIRES SENSING THE DEGREE TO WHICH THE SOFTWARE IS OPERATING OUTSIDE THE DESIGN ENVIRONMENT. THIS EFFORT ADDRESSES THE CONCEPT OF BUILT-IN TEST (BIT) EXPANDED TO INCLUDE SOFTWARE COMPONENT OF BIT. ITS PRIMARY PURPOSE WILL BE TO MONITOR OPERATIONAL SOFTWARE TO DETERMINE WHEN IT IS EXECUTING IN A "NEW" ENVIRONMENT, AND THUS WHEN THERE IS A PROBABILITY THAT THE CONCEPT CAN BE APPLIED TO THE CRISIS OPERATION MODE

FISCAL YEAR 1986

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WHERE SOFTWARE BIT COULD BE INCORPORATED IN THE BATTLE MANAGEMENT SCHEME.

ATLANTIS RESEARCH GP L P ONE INTERCONTINENTAL WY PEABODY, MA 01960 HARVEY A BRAND TITLE: LIFE-CYCLE COST MODEL DEVELOPMENT T 207 OFFICE: BMO/MYSC	AF	\$ 50,000
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THIS PROPOSAL PRESENTS A PLAN FOR DEVELOPING AN ANALYSIS FRAMEWORK AND AN AUTOMATED LIFE-CYCLE COST MODEL FOR THE EVALUATION OF ICBM GUIDANCE AND CONTROL (G&C) SYSTEM OPTIONS. THE PROPOSED FRAMEWORK INCORPORATES THE CONCEPT OF SYSTEM MISSION AVAILABILITY (MA) AND ALSO INCORPORATES MODELS FOR THE HARDWARE ARCHITECTURE, LOGISTICS SCENARIO AND MAINTENANCE POLICIES, AS WELL AS THE MORE TRADITIONAL RELIABILITY AND MAINTAINABILITY (R&M) PARAMETERS OF THE SYSTEM IN QUESTION. THIS METHODOLOGY PROVIDES A QUANTITATIVE MEANS FOR COMPARING COMPLEX G&C SYSTEM OPTIONS ON AN "APPLES-AND-APPLES" BASIS. FURTHER, THIS APPROACH PROVIDES A MEANS FOR EXAMINING THE MAINTENANCE CONCEPTS AND R&M REQUIREMENTS EARLY IN THE DESIGN PHASE OF EACH OPTION. BMO REQUIRES THE ABILITY TO MAKE DESIGN AND PERFORMANCE TRADEOFFS WITH RESPECT TO VIABILITY, AFFORDABILITY, AND OPERABILITY IN SEVERAL ENVIRONMENTS, AMONG MANY VARIATIONS OF COMPLEX SYSTEM IMPLEMENTATIONS. THERE IS A CLEAR NEED FOR A COMMON BASIS FOR MAKING THE COST AND SUPPORTABILITY COMPARISONS WHICH AFFECT THE ULTIMATE REALITY OF ANY PARTICULAR SYSTEM DESIGN. IT IS THE FOCUS OF THIS PROPOSAL TO SUGGEST THE DEVELOPMENT OF APPROPRIATE GENERIC MODELS. NO EXISTING MODELS OFFER SUFFICIENT SENSITIVITY TO PROVIDE THIS ABILITY.

ATMOSPHERIC & ENVIRONMENTAL RESEARCH INC 840 MEMORIAL DR CAMBRIDGE, MA 02139 DR L D KAPLAN/R G ISAACS TITLE: SCRIBE DATA VALIDATION AND ANALYSIS T 7 OFFICE: AFGL/XOP	AF	\$ 49,189
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WE PROPOSE TO INVESTIGATE THE POTENTIAL OF THE UNIQUE SCRIBE HIGH

FISCAL YEAR 1986

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RESOLUTION ATMOSPHERIC EMISSION SPECTRA AND ITS DIURNAL VARIATION IN SEVERAL APPLICATIONS. WE WILL VALIDATE THE SPECTRA BY COMPARISON WITH CALCULATED REFERENCE SYNTHETIC SPECTRA AND WITH OTHER SYNTHETIC SPECTRA. WE WILL CHECK TO SEE WHETHER DISCREPANCIES CAN BE REDUCED OR ELIMINATED BY VARYING THE PROFILES OF TRACE GASES, AND WHETHER ANY REMAINING DISCREPANCIES SUGGEST CHANGES IN THE AFGL SPECTRAL LINE PARAMETERS COMPILATION. WE WILL USE VERY OPAQUE AND VERY TRANSPARENT PARTS OF THE SPECTRA TO OBTAIN INDEPENDENT CALIBRATION POINTS. WE WILL SEARCH FOR UNEXPLAINED LINES AND ATTEMPT TO IDENTIFY THE RESPONSIBLE CONSTITUENT FROM OUR ESTIMATES OF ITS VARIATION WITH HEIGHT, AND FROM LINE SPACING AND INTENSITY DISTRIBUTION. IN PARTICULAR, WE WILL SEARCH FOR LINES OF PHOTOCHEMICALLY ACTIVE MOLECULES WITH EXPECTED DIURNAL VARIATION, TO HELP UNDERSTAND OZONE-RELATED PHOTOCHEMISTRY AND DIURNAL VARIATIONS OF STRATOSPHERIC TRANSPARENCY. WE WILL DEVELOP AND TEST ALGORITHMS FOR RETRIEVING COMPOSITION AND TEMPERATURE PROFILES.

ATMOSPHERIC &amp; ENVIRONMENTAL RSCH INC/AER

AF

\$ 45,736

840 MEMORIAL DR

CAMBRIDGE, MA 02139

R. J. SAATS DR R. N. HOFFMAN

TITLE:

CLOUD PROPERTY DETERMINATION FROM MULTISPECTRAL DMSP DLS

7-1-86

OFFICE: AFSTC/DLAB

THE PROPOSED STUDY WILL DETERMINE CLOUD PROPERTIES FROM SIMULATED MULTISPECTRAL DMSP DLS DATA BY COMBINING A SCENE MODEL APPROACH WITH A VARIETY OF CLOUD PARAMETER RETRIEVAL METHODS. THE MULTISPECTRAL DLS DATA WILL BE TREATED BY RESAMPLING LANDSAT THEMATIC MAPPER SPATIALLY AND SPECTRALLY. THE PROPOSED SENSOR HAS SEVERAL SPECTRAL BANDS WHICH, IN PRINCIPLE, ALLOW CLOUD AMOUNT AND HEIGHT TO BE RETRIEVED. CLOUD PARTICLE SIZE, CLOUD PHASE, AND CLOUD THICKNESS MAY ALSO BE RETRIEVEABLE. THE PROPOSED SCENE MODEL WILL ACCOUNT FOR PARTIAL BEAM FILLING AND IDENTIFY HOMOGENEOUS AREAS IN THE SCENE, THEREBY ALLOWING EFFICIENT COMPOSITING FOR CLOUD PARAMETER RETRIEVAL. WE PLAN TO UTILIZE A VARIETY OF CLOUD PARAMETER RETRIEVAL METHODS INCLUDING B-SPECTRAL, THRESHOLD, AND STATISTICAL METHODS. AS WE DEVELOP AND APPLY PARTICULAR ALGORITHMS, WE WILL PERFORM A VARIETY OF RADIATIVE TRANSFER CALCULATIONS TO OPTIMIZE THESE METHODS.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
ATOM SCIENCES INC 114 RIDGEWAY CTR OAK RIDGE, TN 37830 DR JAMES E PARKS TITLE: TRACE ELEMENT CHARACTERIZATION IN III-V COMPOUNDS BY SPUTTER INITIATED RESONANCE IONIZATION SPECTROSCOPY T 55 OFFICE: RADC/DOR	AF	\$ 48,425

THE VLSI AND VHSC DEVELOPMENT PROGRAMS OF THE AIR FORCE REQUIRE CHARACTERIZATION OF III-V COMPOUNDS WITH AN INTERFERENCE FREE, HIGHLY SENSITIVE ELEMENT ANALYSIS TECHNIQUE HAVING GOOD LATERAL AND DEPTH RESOLUTION. SPUTTER INITIATED RESONANCE IONIZATION SPECTROSCOPY (SIRIS), AN ULTRASENSITIVE ANALYTICAL TECHNIQUE DEVELOPED BY ATOM SCIENCES, HAS BEEN DEMONSTRATED IN SILICON TO HAVE GOOD SENSITIVITY AND BE INTERFERENCE FREE. DETECTION LIMITS OF 2 ppb (1X10<sup>-10</sup> TO THE 14TH POWER/CM<sup>3</sup>) HAVE BEEN SHOWN FOR GALLIUM IN BULK SILICON. THE LATERAL AND DEPTH RESOLUTION OF THE PRESENT APPARATUS ARE NOT ADEQUATE FOR THE PRESENT AND FUTURE NEEDS OF THE SEMICONDUCTOR INDUSTRY. LATERAL RESOLUTION OF 100 TO 5 MICRONS ARE NECESSARY. RESOLUTIONS INTO THE SUBMICRON RANGE WILL BE REQUIRED IN THE FUTURE. WE PROPOSE TO DETERMINE THE FEASIBILITY OF USING THE SIRIS TECHNIQUE AND APPARATUS WILL BE TESTED FOR IMPROVED SENSITIVITY AND LATERAL RESOLUTION. THE FEASIBILITY FOR IMPROVING LATERAL RESOLUTION TO 5 MICRONS IN PHASE II OF THE PROPOSED PROGRAM WILL BE DETERMINED.

ATOM SCIENCES INC 114 RIDGEWAY CTR OAK RIDGE, TN 37830 DR NORBERT THONNARD TITLE: OPTICAL PHYSICS STUDY OF LASER INTERACTIONS WITH SOLIDS FOR ULTRA-TRACE MATERIALS ANALYSIS USING RIS T 13 OFFICE: AFOSR/XOT	AF	\$ 55,400
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REQUIREMENTS FOR MATERIAL CHARACTERIZATION ARE BECOMING MORE STRINGENT AS THE ROLE OF THE TRACE ELEMENT COMPOSITION OF HIGH TECHNOLOGY DEVICES BECOMES APPARENT. IN SEMICONDUCTOR RESEARCH, FOR INSTANCE, THERE IS A NEED FOR ULTRA-TRACE ELEMENT ANALYSIS IN SOLIDS BELOW THE PPBA LEVEL WITH SPATIAL RESOLUTION IN THE FEW MICRON RANGE. RESONANCE IONIZATION SPECTROSCOPY (RIS) INVOLVES THE STEPWISE



FISCAL YEAR 1986

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EXCITATION, IONIZATION, AND COUNTING OF ATOMS OF A PRE-SELECTED ELEMENT, GENERALLY IN A LARGE BACKGROUND OF OTHER ELEMENTS. NARROW-BAND LASERS ALLOW SUFFICIENT OPTICAL POWER TO IONIZE MOST ATOMS OF THE SELECTED ELEMENT WITH NEGLIGIBLE IONIZATION OF THE OTHER ELEMENTS. IN RIS, THE SENSITIVITY DEPENDS ON THE NUMBER OF ATOMS THAT ARE IN THE LASER BEAM. LASER ABLATION CAN PROVIDE ATOM DENSITIES AS HIGH AS  $10^{10}$  TO THE  $20^{th}$  POWER  $\text{cm}^{-3}$  WITH RESOLUTION OF A FEW MICRONS. AT  $>10^{10}$  TO THE  $7^{th}$  POWER  $\text{W cm}^{-2}$ , PLASMAS ARE FORMED, WITH HIGH ENERGY IONS DEGRADING MASS DISCRIMINATION. BECAUSE OF THE HIGH ION FIELD, MOST WORKERS ATTEMPT TO OPERATE CLOSE TO THIS THRESHOLD. WITH RIS, LASER ABLATION NEED ONLY VAPORIZED, PERMITTING POWER DENSITIES OF  $\sim 10^{10}$  TO THE  $7^{th}$  POWER  $\text{W cm}^{-2}$ , AT WHICH MOSTLY NEUTRALS ARE FORMED. WE PROPOSE INVESTIGATING QUANTIFICATION OF LASER ABLATION TO DETERMINE IF COMBINED WITH RIS, UNPRECEDENTED SENSITIVITY IN MATERIAL ANALYSIS BECOMES POSSIBLE.

AUGUST DESIGN &amp; DEVELOPMENT

ARMY

\$ 50,000

PO BOX 235

MERION STATION, PA 19066

D E LEE

TITLE:

AUTOMATED ALL-WEATHER CARGO TRANSFER SYSTEM

T 103

OFFICE: BRDC

THIS INITIATIVE LINKS RELATIVE MOTION PROBLEMS BETWEEN SHIPS AND LIGHTERS & LOTS ENVIRONMENTS DURING HEAVY SEAS TO AN OVERALL NEED FOR AN IMPROVED CARGO HANDLING SYSTEM. PRESENT METHODS AND HARDWARE REPRESENT WORLD WAR II TECHNOLOGY. A MODULAR BARGE INTERFACE SYSTEM USING A COMPUTER-CONTROLLED, ELECTRO-HYDRAULICALLY ACTUATED, CARGO TRANSFER SYSTEM COULD SAFELY AND RELIABLY HANDLE CONTAINERIZED OR BREAKBULK CARGO IN CONDITIONS ABOVE SS3 AND POSSIBLE SS6. EMERGING TECHNOLOGY WOULD BE APPLIED TO DEVELOP A VERY INTELLIGENT ROBOTIC CARGO HANDLING SYSTEM TO LOAD/UNLOAD SHIPS AND TO INTEGRATE CARGO TRANSFER WITH LIGHTERAGE SEAWAY MOTION. THE SYSTEM WOULD BE MODULAR FOR DEPLOYMENT. THE PRINCIPAL INVESTIGATOR HAS ASSEMBLED A TEAM THAT UNDERSTANDS THE ARMY'S PROBLEM AND CAN DESIGN AND FABRICATE ADVANCED SYSTEMS HARDWARE FOR DEVELOPMENT, TEST, AND PRODUCTION. THE TEAM DRAWS ENGINEERING EXPERIENCE FROM THIS NATION'S MOST ADVANCED RESEARCH PROGRAMS, SUCH AS FUSION REACTOR DEVELOPMENT UNDERWAY AT PENNSYLVANIA AND ROBOTIC/ARTIFICIAL INTELLIGENCE FOR MAJOR INDUSTRY LEADERS. OTHER SELECTED EXPERIENCE INCLUDES ALMOST 3 YEARS IN AMERICA'S

FISCAL YEAR 1986

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OPERATIONS AND ALMOST 10 YEARS IN DEVELOPMENT AND MANUFACTURE OF MOTION SIMULATORS. THE TEAM CAN TAKE THIS ADVANCED CONCEPT FROM INCEPTION THROUGH TO FINAL CONFIGURATION AS AN ALL-WEATHER ARMY CAPABILITY.

AUSTIN RESEARCH ASSOCS  
1901 RUTLAND DR  
AUSTIN, TX 78758  
DR M L SLOAN  
TITLE:

SDIO

\$ 99,981

REDUCTION OF RADIATION DAMAGE IN RAIL GUNS  
T 2 OFFICE:

RAIL DAMAGE IS A MAJOR CONCERN IN THE DEVELOPMENT OF HIGH CURRENT RAIL GUNS. THE HIGH CURRENT RAIL GUN BUILT AT MAXWELL LABORATORIES UNDER DNA SPONSORSHIP PROVIDES AN UNUSUAL OPPORTUNITY TO EXPLORE RAIL GUN PERFORMANCE, AND IN PARTICULAR RAIL DAMAGE, IN A DEVICE OF SIGNIFICANT SIZE. THE FACILITY IS CURRENTLY OPERATIONAL WITH BOTH ELECTRIC AND MAGNETIC PROBE DIAGNOSTICS. USING THIS PROBE DATA AND A THEORETICAL MODEL OF THE PLASMA ARMATURE, IT IS POSSIBLE TO PREDICT NOT ONLY THE KINEMATICS OF THE PROJECTILE, BUT ALSO THE RADIATION FROM THE ARMATURE AND THUS THE WALL DAMAGE. THE SAME MODEL ALSO PROVIDES THE INSIGHT NECESSARY TO DESIGN ARMATURES WHICH PRODUCE FAR LESS RADIATION. THE PREDICTED RADIATION CAN BE COMPARED WITH EXPERIMENTALLY OBSERVED RADIATION AND IF THE AGREEMENT IS SATISFACTORY, THE ARMATURE MODEL CAN THEN BE USED TO GUIDE THE DEVELOPMENT OF ARMATURES WHICH PRODUCE SIGNIFICANTLY LESS RADIATION DAMAGE.

AUSTIN RESEARCH ASSOCS  
1901 RUTLAND DR  
AUSTIN, TX 78758  
DR M L SLOAN  
TITLE:

DNA

\$ 49,088

ANALYSIS OF HANE -1 SECOND MHD EMP  
OFFICE: AM SBIR

MODELING OF THE AMBIENT AND PROMPT IONOSPHERIC REGIONS IN A THIN LAYER APPROXIMATION ALLOWS AN EFFICIENT METHOD OF DETERMINING THE TIME EVOLUTION OF PROPAGATION, AND SIGNAL STRENGTH OF THE 0-10 SECOND EMP ASSOCIATED WITH HIGH ALTITUDE NUCLEAR DETONATIONS.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
AUTOMATED ANALYSIS CORP 2200 FULLER RD ANN ARBOR, MI 48105 STERGIOS LIAPIS TITLE: EXPLORATORY DEVELOPMENT OF A SURFACE EFFECT SEAKEEPING ANALYSIS COMPUTER PROGRAM T 187 OFFICE: NSRDC	NAVY	\$ 49,666

THE INTENTION IS TO DEVELOP A NUMERICAL METHOD TO ASSESS THE SEAKEEPING CHARACTERISTICS OF A SURFACE-EFFECT SHIP (SES). THIS WOULD RESULT IN A COMPUTER PROGRAM WHICH PROPERLY CONSIDERS THE UNIQUE COMPLEXITIES OF AN SES. THE COMPLEXITIES INCLUDE, BUT ARE NOT LIMITED TO, THE HYDRODYNAMICS, THE AERODYNAMICS, THE CRAFT LAYOUT AND SEALS, FAN DYNAMICS AND HEAVE ATTENUATION DEVICES. THE HYDRODYNAMIC PROBLEM WILL BE CONSIDERED USING A LINEARIZED TIME-DOMAIN FORMULATION OF THE NONLINEAR BEHAVIOR OF THE VEHICLE DURING HEAVE, PITCH AND ROLL MOTIONS OVER INCOMING WAVES. WAVE EFFECTS GENERATED BY THE APPLIED PRESSURE DISTRIBUTION AS WELL AS THE SIDEWALLS WILL BE CONSIDERED. AIR COMPRESSIBILITY WILL BE TAKEN INTO ACCOUNT BY CALCULATING THE CHANGE IN DENSITY DUE TO THE CHANGE IN PRESSURE USING AN ADIABATIC ISOTROPIC RELATIONSHIP. FORMULATION OF THE PROBLEM WILL BE GENERAL SUCH THAT ANY FORM OF SES MAY BE CONSIDERED. FAN DYNAMICS WILL BE INCLUDED USING A QUADRATIC RELATIONSHIP BETWEEN PRESSURE AND VOLUME FLOW. HEAVE ATTENUATION DEVICES (VENT VALVE OR VARIABLE-INLET-GUIDE VANE TYPE) WILL BE CONSIDERED BY CHANGING THE APPLIED PRESSURE OR FAN PRESSURE FLOW CURVES. THE PRODUCT OF THIS PROJECT WILL BE THE SPECIFICATIONS OF A COMPUTER PROGRAM CAPABLE OF ACCURATELY PREDICTING HEAVE, PITCH AND ROLL DISPLACEMENTS, VELOCITIES AND ACCELERATIONS OF ANY SES.

AUTOMATED DIAGNOSTIC SYSTEMS INC 2422 S WALTER REED DR ARLINGTON, VA 22206 DR JOHN W COMBS TITLE: RAPID AUTOMATED DIAGNOSIS OF MALARIA IN THE MILITARY ENVIRONMENT T 210 OFFICE: AMRDC/SGRD	ARMY	\$ 50,000
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THE PRODUCT OF THIS PROJECT WILL DEMONSTRATE THE FEASIBILITY OF DETEC-

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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TION AND CLASSIFICATION OF PATHOGENIC MICROBES BY A FULLY AUTOMATED SYSTEM WHICH WILL OPERATE IN A WIDE RANGE OF MILITARY, SPACE, AND CIVILIAN ENVIRONMENTS. BECAUSE OF ITS MILITARY RELEVANCE, PREVALENCE, MORBIDITY, MORTALITY, AND DIAGNOSTIC AND THERAPEUTIC COMPLEXITY, MALARIA WILL BE STUDIED AS A PROTOTYPIC DISEASE. IN PHASE I, THE DETAILED SPECTRAL CHARACTERISTICS OF THE INTERNAL-CONSTITUENTS OF UNSTAINED AND CYTOCHEMICALLY STAINED MALARIA PARASITES AND INFECTED HOST ERYTHROCYTES WILL BE DETERMINED. FLUORESCENT ANTIBODIES DIRECTED AGAINST ANTIGENS OF THE PARASITES WILL BE TESTED FOR SUITABILITY AS QUANTITATIVE IMMUNOFLOUORESCENT PROBES. DIAGNOSTIC CLUES FOR DETECTION AND SPECIATION OF MALARIA PARASITES FOUND IN THESE PILOT STUDIES WILL BE EVALUATED FOR INCORPORATION INTO A RELIABLE, LOW-COST, DISPOSABLE DEVICE USEFUL IN THE MILITARY MEDICAL CONTEXT RANGING FROM THE BASE HOSPITAL TO THE BATTLE ZONE. THE RESULTS WILL ALSO GUIDE THE EXPLORATION OF AUTOMATED DETECTION AND CLASSIFICATION OF OTHER PATHOGENS OF MILITARY IMPORTANCE.

AUTOMATED DYNAMICS CORP 105 JORDAN RD TROY, NY 12180 KENNETH B BUBECK TITLE: PROCESSING GRAPHITE WITH PEEK USING A THERMOPLSTIC WELDING HEAD AND THE ROBOTIC WINDING SYSTEM (ROWS) T 41 OFFICE: AVSCOM/AMSAV	ARMY	\$ 50,000
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IT HAS BEEN RECOGNIZED BY THIS FIRM THAT FIBER REINFORCED THERMOPLASTIC COMPOSITES MATERIALS OFFER COST AND PERFORMANCE ADVANTAGES COMPARED TO CONVENTIONAL THERMOSETTING MATERIALS. THE INDUSTRY IS GOING TO BE FACED WITH SEARCHING FOR THREE DIMENSIONAL FABRICATION TECHNIQUES THAT ARE AUTOMATED AND USE ADVANCED CONCEPTS IN CAD/CAM. THIS PROPOSAL DESCRIBES AN EFFORT TO USE AVAILABLE PRE-PREG MATERIALS AND RESEARCH A TECHNIQUE FOR FABRICATING INTEGRALLY STIFFENED STRUCTURAL PREFORMS. THIS FIRM HAS SUCCESSFULLY DEVELOPED THE TECHNIQUE ROWS FOR FILAMENT WINDING THERMOSET COMPOSITE MATERIALS USING A ROBOTIC MANIPULATOR, INTELLIGENT WINDING MECHANISM AND SOPHISTICATED CAD/CAM SOFTWARE PACKAGES. IT IS BELIEVED BY THE PRINCIPLE INVESTIGATOR OF THIS PROPOSAL THAT A THERMOPLASTIC WELDING HEAD CAN BE DESIGNED AND BUILT THAT WILL EFFECTIVELY PROCESS THERMOPLASTIC THROUGH AUTOMATION TOOLS ALREADY DEVELOPED BY THIS FIRM. FUTURE RESEARCH EFFORTS WILL FOCUS ON ESTABLISHING A ROBOTIC WORKCELL THAT

FISCAL YEAR 1986

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WILL PROCESS THIS MATERIAL IN A PRODUCTION ENVIRONMENT.

AUTOMATIX INC 1000 TECHNOLOGY PARK DR BILLERICA, MA 01821 DR JOHN E AGAPAKIS TITLE: VISION AIDED ROBOTIC EXPERT WELDING SYSTEM T 66 OFFICE: NAVSEA	NAVY	\$ 49,709
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THE OBJECTIVE OF THIS PROJECT IS TO ADVANCE THE STATE-OF-THE-ART OF VISION GUIDED ROBOTIC WELDING (SEAM TRACKING) BY THE DEVELOPMENT OF EXPERT SYSTEMS CAPABLE OF ADAPTING THE WELDING PARAMETERS TO COMPENSATE FOR WELDING PROCESS DISTURBANCES. IN PHASE I OF THE PROJECT, WE WILL FOCUS ON ADAPTATION TO JOINT GEOMETRY VARIATIONS AND ESTABLISH THE FEASIBILITY OF THE OVERALL APPROACH. EXPERIMENTS WILL BE PERFORMED IN ORDER TO ANALYZE THE HUMAN WELDING ENGINEERING EXPERTISE AND KNOWLEDGE NECESSARY FOR THE INITIAL SELECTION, ITERATIVE REFINEMENT, AND ADJUSTMENT OF WELDING PARAMETERS IN RESPONSE TO CONDITION VARIATIONS. A PROTOTYPE RULE-BASED EXPERT SYSTEM FOR JOINT GEOMETRY ADAPTATION WILL BE DEVELOPED IN ORDER TO AUGMENT CONVENTIONAL SEAM-TRACKING. DIRECTIONS FOR FUTURE WORK WILL BE ESTABLISHED AND PRESENTED IN A PROPOSAL FOR PHASE II.

AVERETTE R D & CO INC 77 UNDERWOOD ST NW WASHINGTON, DC 20012 ROBERT D AVERETTE JR TITLE: FLUO DYNAMIC CHROMATOGRAPH T 220 OFFICE: AMRDC/SGRD	ARMY	\$ 50,000
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THE FEASIBILITY OF SHOCK OR SHEAR SENSITIVE COLLOIDAL SEPARATION BY FLOW THROUGH THIN CHANNELS IS EXAMINED. COLLOIDAL SIZE PARTICLES HAVE LOW DIFFUSIVITIES AND MAY BE FRACTIONATED BY FLOW. IN SEPARATION BY FLOW A SAMPLE IN A CARRIER IS INJECTED INTO A COLUMN WITH BOUNDARY LAYER VELOCITY GRADIENTS DEVELOPING, CAUSING PARTICLES TO EMERGE FROM THE COLUMN ACCORDING TO SIZE. THIS METHODS ADVANTAGES IS ITS ABILITY TO DETECT SIZE DISTRIBUTIONS, LOW COST AND EASE OF USE WITH SHOCK OR SHEAR SENSITIVE MATERIALS.

FISCAL YEAR 1986

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AVIATION RESEARCH ASSOCS 4351 BRAUNTON RD COLUMBUS, OH 43220 RICHARD S JENSEN TITLE: PILOT JUDGMENT SKILLS TEST BATTERY T 285 OFFICE: AMD/RDO	AF	\$ 49,967

DURING PHASE I, THE AVIATION RESEARCH ASSOCIATES GROUP PROPOSES TO DEVELOP A PILOT JUDGMENT SKILLS TEST BATTERY FOR USE ON AN IBM PC/XT APPLICABLE TO THE MILITARY PILOT OF HIGH PERFORMANCE AIRCRAFT. THIS TEST BATTERY WILL BE DESIGNED TO DISCRIMINATE BETWEEN JUDGMENT AND DECISION MAKING THROUGH THE USE OF A CONCEPTUAL MODEL WHICH IDENTIFIES THE TYPES OF INSTRUMENTS NEEDED FOR EACH ELEMENT IN THE JUDGMENTAL PROCESS. SIX BASIC TESTS ARE PROPOSED FOR THIS BATTERY AS FOLLOWS: KNOWLEDGE, VIGILANCE, RECOGNITION AND DIAGNOSIS, ALTERNATIVE GENERATION AND SELECTION, RISK ASSESSMENT, AND RISK-TAKING TENDENCY. EACH OF THE TESTS WILL BE DESIGNED SO AS TO PERMIT THE USE OF FEEDBACK FOR TRAINING PURPOSES. A BRIEF TRAINING TEST WILL BE CONDUCTED TO ASSESS THE VALUE OF THE PACKAGE. THE MAJOR SYSTEMATIC TRANSFER OF TRAINING PROGRAMS WILL BE CONDUCTED DURING PHASE II.

BAND LAVIS & ASSOCS INC 670 RITCHIE HWY SEVERNA PARK, MD 21146 A W FOWLER TITLE: STABILIZATION OF THE SHIP/LIGHTER INTERFACE T 103 OFFICE: BRDC	ARMY	\$ 34,671
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THE PROPOSED WORK TO ESTABLISH ONE OR MORE TECHNIQUES FOR OFFLOADING CONTAINERS AND BREAK-BULK IN ALL TYPES OF WEATHER DURING A LOT'S MISSION CONSISTS OF A REVIEW OF CONCEPTS FOR SHIP STABILIZATION, LIGHTER STABILIZATION AND LOAD STABILIZATION AS INDIVIDUAL SYSTEMS AND AS MEMBERS OF COMBINED SYSTEMS. A NUMBER OF REPRESENTATIVE STABILIZATION, LOAD TRANSFER AND LOAD CONTROL SYSTEMS HAVE BEEN IDENTIFIED AND BRIEFLY DESCRIBED IN THIS PROPOSAL UNDER CATEGORIES OF PASSIVE AND ACTIVE ROLL STABILIZATION, LIGHTER-TO-SHIP STABILIZATION, SHIP-TO-SHIP STABILIZATION, COMPUTER-AIDED CRANE SYSTEMS,

FISCAL YEAR 1986

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TRACKED CARGO-TRANSFER SYSTEMS AND CABLE STABILIZED SYSTEMS. A SELECTION OF THESE, INCLUDING COMBINED SYSTEMS, WILL BE MADE WITH ARMY PARTICIPATION AND WILL BE EVALUATED TO DETERMINE PERFORMANCE, SAFETY, ADAPTABILITY, PENDULATION, SPOTTING, APPROACH CONTROL, INSTALLATION, SET-UP, SPACE, WEIGHT, MANPOWER, RESEARCH AND DEVELOPMENT REQUIREMENTS, AND COSTS. FOLLOWING THIS, A FINAL SELECTION WILL BE MADE OF THE BEST ALL-AROUND SYSTEM FOR EXPERIMENTAL VERIFICATION IN PHASE II, USING A DYNAMICALLY CORRECT SCALE MODEL, SIMULATED SHIP AND LIGHTER MOTION, AND FULL SCALE CONTROL PACKAGE. PHASE III INCLUDES FULL-SCALE DEMONSTRATION OF THE SYSTEM ON A SELECTED SHIP.

BATTERY ENGINEERING INC 1636 HYDE PARK AVE HYDE PARK, MA 02136 PHILIP F KANE TITLE: CATALYZED CARBON CATHODES FOR LITHIUM/THIONYL CHLORIDE BATTERIES T 114	NAVY	\$ 49,675
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THE GOAL OF THE PROPOSED PROGRAM IS IMPROVEMENT OF CURRENT STATE-OF-THE-ART LITHIUM/THIONYL CHLORIDE BATTERY TECHNOLOGY THROUGH THE USE OF CARBON-BASED CATHODES CONTAINING ADVANCED NON-NOBLE CATALYSTS. DRAMATIC IMPROVEMENTS IN BOTH SAFETY AND PERFORMANCE HAVE BEEN REALIZED THROUGH THE USE OF SPECIFIC ORGANOMETALLIC CATALYSTS SUCH AS COBALT-BASED PTHALOCYANINE AND TETRAAZODIBENZOANNULENE, RESULTING IN HIGHER RATE CAPABILITIES, OPERATING VOLTAGES, AND REDUCED HEAT GENERATION. THUS FAR THE CATALYSTS WHICH HAVE BEEN EVALUATED AS  $\text{SOCl}_2$  REDUCERS HAVE BEEN PREVIOUSLY UTILIZED AS OXYGEN-REDUCTION CATALYSTS IN FUEL CELLS. PREVIOUS FEW OF THESE CATALYSTS HAVE BEEN EVALUATED IN THE  $\text{Li}/\text{SOCl}_2$  SYSTEM. THIS PROGRAM PROPOSES TO EVALUATE THE PERFORMANCE OF TWO IMPORTANT CLASSES OF FUEL CELL CATALYSTS, SPINELS AND PORYPHYRINS, AS THIONYL CHLORIDE REDUCTION CATALYSTS IN THE  $\text{Li}/\text{SOCl}_2$  BATTERY SYSTEM. TWO TYPES OF STUDIES WILL BE PERFORMED UNDER THIS PROGRAM: CHEMICAL STABILITY OF THE PROPOSED CANDIDATES IN THE  $\text{Li}/\text{SOCl}_2$  SYSTEM, AND INITIAL ELECTROCHEMICAL PERFORMANCE. COMPATIBILITY STUDIES WILL BE PERFORMED WITH ELECTROLYTE ALONE, AND IN THE COMPLETE BATTERY SYSTEM. ELECTROCHEMICAL EVALUATION WILL CONSIST OF RATE CAPABILITY, OPERATING VOLTAGE, DISCHARGE CAPACITY AND HEAT GENERATION STUDIES.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
BEERS ASSOCS INC PO BOX 2549 RESTON, VA 22090 BRIAN L BEERS TITLE: A SURVIVABILITY OPTIONS TRADEOFF METHODOLOGY DEVELOPMENT T 5 OFFICE: AM/SBIR	DNA	\$ 49,943

IT IS PROPOSED TO DEVELOP A MANAGEMENT METHODOLOGY FOR PERFORMING TRADEOFF STUDIES OF NUCLEAR SURVIVABILITY OPTIONS FOR BATTLEFIELD SYSTEMS. THE PURPOSE FOR THE METHODOLOGY IS TO PROVIDE SYSTEMS MANAGERS (AND THEIR ADVISERS) A METHOD FOR ENSURING THE COST-EFFECTIVE SURVIVABILITY TECHNIQUES ARE INCLUDED IN THE SYSTEMS PLANNING IN EARLY STAGES. THE INTENT OF THE PROPOSAL IS TO SUPPORT IMPLEMENTATION OF DoD I 4245.4 IN A COST-EFFECTIVE MANNER. THE SPECIFIC OBJECTIVES OF THE STUDY ARE TO DEVELOP: (1) A COMPENDIUM OF GENERAL MANAGEMENT PROCEDURES FOR IMPLEMENTING SURVIVABILITY TRADE STUDIES; (2) A CANDIDATE LIST OF NUCLEAR SURVIVABILITY ENHANCEMENT OPTIONS AND A SET OF PROCEDURES FOR QUANTIFYING SPECIFIC OPTION FEATURES; AND (3) A WELL-DEFINED GENERAL MATHEMATICAL PROCEDURE FOR PERFORMING THE TRADE STUDIES.

BEHAVIORAL RESEARCH ASSOCS 693 N 400 W WEST LAFAYETTE, IN 47906 DR ROBERT D SORKIN TITLE: AUDITORY HEADS-UP COCKPIT DISPLAY SYSTEM T 95 OFFICE: ASD/XR	AF	\$ 47,350
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THE PROJECT WILL EVALUATE A NEW TYPE OF AUDITORY HEADS-UP COCKPIT DISPLAY SYSTEM (AHUD). THE PROPOSED DEVICE COMBINES NEW TECHNIQUES IN THREE-DIMENSIONAL SOUND PRESENTATION WITH A TECHNICAL INNOVATION. THE SYSTEM CAN PRESENT THE PILOT WITH AN AUDITORY DISPLAY OF THE SPATIAL LOCATION OF GROUND OR AIRBORNE RADAR TARGETS, AS WELL AS OTHER FLIGHT DATA. THIS AUDITORY INPUT IS PRESENTED IN A WAY THAT IS COMPLETELY CONSISTENT WITH THE PILOT'S NORMAL VISUAL INFORMATION. THE SYSTEM ALSO HAS THE CAPABILITY OF INTEGRATING EXISTING AUDITORY DISPLAYS AND COMMUNICATION CHANNELS INTO A SINGLE, COHERENT AND EASY TO USE DISPLAY SYSTEM. USE OF THE SYSTEM SHOULD RESULT IN IMPROVED PILOT PERFORMANCE AND REDUCED ERROR, ESPECIALLY UNDER HIGH WORKLOAD CONDITIONS.



FISCAL YEAR 1986

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TIONS. THE PROJECT WILL TEST THE FEASIBILITY OF THE PROPOSED AHUD SYSTEM AND CONSIDER SOME PRACTICAL ASPECTS OF ITS IMPLEMENTATION IN THE AIRCRAFT ENVIRONMENT.

BELTRAN INC 1133 E 35TH ST BROOKLYN, NY 11210 MICHAEL R BELTRAN TITLE: ADVANCED HEAT PIPES-MAGNETOHYDRODYNAMIC LIQUID DELIVERY T 4 OFFICE:	SDIO	\$ 75,000
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THE PHASE I RESEARCH PROGRAM WILL BE DIRECTED TOWARDS DEVELOPING A MAGNETOHYDRODYNAMIC (MHD) ENHANCED HEAT PIPE. HIGH TEMPERATURE HEAT PIPES OPERATING IN THE RANGE OF 1000 TO 2000K ARE REQUIRED FOR PRIMARY POWER GENERATION AND AMBIENT TEMPERATURE HEAT PIPES FOR PAYLOAD COOLING IN THE RANGE OF 300K. MAGNETOHYDRODYNAMIC FORCES CAN BE UTILIZED TO ENHANCE CONDENSATE TRANSPORT FOR HEAT PIPE FLUIDS WHICH ARE MAGNETIC OR ELECTRICALLY CONDUCTIVE. HIGH TEMPERATURE HEAT PIPES UTILIZE LIQUID METALS WHICH ARE SUITABLE FOR MHD ENHANCEMENT DUE TO THEIR ELECTRICAL CONDUCTIVITY. THE MHD HEAT PIPE WILL CONCENTRATE THE PUMPING FORCES IN THE INNER SURFACE OF THE PIPE WHERE TRANSPORT OF THE CONDENSATE FILM IS MOST EFFECTIVE FOR HEAT TRANSFER. MHD FORCES CAN BE UTILIZED FOR AMBIENT TEMPERATURE HEAT PIPES IN THE 300K RANGE. MHD FORCES CAN BE UTILIZED TO TRANSPORT MAGNETIC FLUIDS, SUCH AS FERRO MAGNETIC FLUIDS, AND ELECTRICALLY CONDUCTIVE FLUIDS, SUCH AS WATER BASED SOLUTIONS. BELTRAN WILL WORK WITH VARIOUS UNIVERSITY CONSULTANTS WHO ARE EXPERTS IN THE FIELD OF HEAT PIPES AND MHD. THIS PROGRAM WILL BE AVAILABLE FOR NEW YORK STATE SBIR FUND MATCHING WHICH CAN DOUBLE THE LEVEL OF EFFORT WITHOUT ADDED COST OF THE FUNDING AGENCY.

BELTRAN INC 1133 E 35TH ST BROOKLYN, NY 11210 MICHAEL R BELTRAN TITLE: STRUCTURAL PROPERTIES OF SOLID PROPELLANTS T 247 OFFICE: BMO/MYSC	AF	\$ 50,000
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DESIGN OF HIGH ACCELERATION MISSILES FOR AIR FORCE MISSIONS REQUIRES

FISCAL YEAR 1986

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METHODS OF INCREASING THE STRUCTURAL STRENGTH OF SOLID PROPELLANTS TO PROVIDE GREATER LOAD CARRYING CAPACITY OF THE TOTAL MISSILE. HIGH ACCELERATION INCREASES THE FORCES ON THE SOLID PROPELLANT GRAIN CAUSING THE GRAIN TO SLUMP OR DEFORM. IN ADDITION TO INCREASING STRUCTURAL PARAMETERS, IT IS DESIRABLE TO INCREASE THE PROPELLANT'S BURNING RATE AND SPECIFIC IMPULSE. MATERIALS LIKE ALUMINUM, BORON, BERYLLIUM, ZIRCONIUM, TITANIUM AND MAGNESIUM HAVE BEEN ADDED TO SOLID PROPELLANTS TO IMPROVE SPECIFIC IMPULSE. USUALLY THESE METALS HAVE BEEN ADDED IN POWDER FORM, BUT IT IS POSSIBLE TO USE FIBERS, WIRES, FOILS AND SCREENS OF THESE MATERIALS TO ENHANCE STRENGTH, PERFORMANCE AND BURNING RATE. THE PHASE I STUDY WILL DEFINE THE LIMITS OF STRUCTURAL ENHANCEMENT POSSIBLE AND THE LOADS INDUCED BY VARIOUS MISSION PROFILES. PHASE II WILL DEVELOP ANALYTICAL AND EXPERIMENTAL RESULTS FOR THE MOST PROGRAM CONCEPTS. THE UNITED TECHNOLOGIES CORPORATION HAS AGREED TO WORK WITH BELTRAN ON THE PHASE II PROGRAM, WHERE FORMULATION AND FABRICATION OF SOLID PROPELLANT MAY BE REQUIRED. THIS PROGRAM IS AVAILABLE FOR THE NEW YORK STATE FUND MATCHING PROGRAM WHERE THE FUNDING AGENCY CAN DOUBLE THE R&D WITHOUT EXPENDING FUNDS ABOVE THE ORIGINAL SBIR CONTRACT.

BEND RESEARCH INC 64550 RESEARCH RD BEND, OR 97701 DWAYNE T FRIESEN TITLE: THIN-FILM-COMPOSITE MEMBRANES FOR ON-BOARD INERT GAS GENERATION T 178	AF	\$ 71,761
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OFFICE: AFWAL/PO

AIRCRAFT FUEL TANKS CAN BE PROTECTED FROM FIRE AND EXPLOSION BY FILLING THE VAPOR SPACE ABOVE THE LIQUID FUEL WITH AN INERT GAS SUCH AS NITROGEN. A LOW-MAINTENANCE, MEMBRANE-BASED ON-BOARD INERT GAS GENERATION SYSTEMS (OBIGGS) IS A PROMISING ALTERNATIVE TO THE CURRENTLY USED HIGH-MAINTENANCE LIQUID NITROGEN SYSTEM. HOWEVER, RECENTLY DEVELOPED MEMBRANE-BASED OBIGGS ARE INEFFICIENT IN THEIR REMOVAL OF OXYGEN FROM AIR AND ARE THUS TOO HEAVY FOR PRACTICAL USE IN NITROGEN PRODUCTION. WE PROPOSE TO DEMONSTRATE THE TECHNICAL FEASIBILITY OF PRODUCING AN OBIGGS IN WHICH THE WEIGHT OF ACTIVE MEMBRANE MATERIAL IS DECREASED BY MORE THAN AN ORDER OF MAGNITUDE OVER PRESENT MEMBRANE-BASED OBIGGS. A NOVEL, EXCEEDINGLY THIN MEMBRANE CURRENTLY UNDER DEVELOPMENT AT BEND RESEARCH FOR A RELATED APPLICATION WILL BE CHEMICALLY MODIFIED TO OBTAIN HIGH OXYGEN PERMEATION RATES. THESE

FISCAL YEAR 1986

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ULTRATHIN MEMBRANES HAVE VERY HIGH GAS THROUGHPUT PER UNIT AREA, AND THUS LESS MEMBRANE MATERIAL IS REQUIRED THAN IN CURRENT MEMBRANE-BASED OBIGGS FOR THE SAME OVERALL PERFORMANCE. OUR ENGINEERING CALCULATIONS SHOW THAT AN ULTRATHIN MEMBRANE WITH THE OPTIMAL CHEMISTRY WILL POTENTIALLY RESULT IN A 300-FOLD WEIGHT REDUCTION OVER CURRENT OBIGGS.

BERKELEY RESEARCH ASSOCS INC PO BOX 241 BERKELEY, CA 94701 UDAY GUPTA TITLE: ATOMIC PROCESSES FOR X-RAY LASERS MODELING T 1 OFFICE:	SDIO	\$ 47,434
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DEVELOPMENT OF X-RAY LASERS OPERATING BOTH IN THE SOFT AND HARD X-RAY REGION IS CURRENTLY AN AREA OF STRONG RESEARCH INTEREST. THE STRONG INTEREST IN X-RAY LASER RESEARCH STEMS FROM ITS USEFULNESS BOTH TO THE SDIO MISSION AS WELL AS FOR SCIENTIFIC AND COMMERCIAL APPLICATIONS. A COMBINATION OF A VARIETY OF ATOMIC PROCESSES DETERMINES THE OVERALL CHARACTERISTICS, LASING AND GAIN OF SUCH LASERS. REALISTIC AND ACCURATE MODELLING OF THESE ATOMIC PROCESSES APPLICABLE IN A WIDE VARIETY OF SYSTEM CONDITION IS CRUCIAL IN ORDER TO STUDY THE FEASIBILITY AND OPTIMUM OPERATING CONDITIONS OF X-RAY LASER SYSTEMS. THE PRESENT PAPER EXAMINES SOME OF THESE ASPECTS AND OUTLINES THE RELEVANT MODELS CAPABLE OF PROVIDING RELIABLE ATOMIC DATA OVER A WIDE RANGE OF SYSTEM CONDITIONS. OF PARTICULAR IMPORTANCE IS THE ATOMIC STRUCTURE CODE FOR MULTI-ELECTRON IONS OF SPECIFIC CONFIGURATIONS IN PLASMA MEDIUMS AND THE CORRESPONDING RADIATIVE AND EXCITATION PROCESSES. THE PHASE I RESEARCH FOCUSSES ON THE DENSITY AND TEMPERATURE EFFECTS ON THE ATOMIC STRUCTURE AND PROCESSES RELEVANT TO X-RAY LASER PLASMAS.

BERNER LANPHIER & ASSOCS 7315 WISCONSIN AVE - STE 429W BETHESDA, MD 20814 STEVEN D BERNER TITLE: LAUNCH VEHICLE COST MODEL DEVELOPMENT T 59 OFFICE: AFSTC/OLAB	AF	\$ 49,159
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THE DEVELOPMENT OF AN INDEPENDENT, OBJECTIVE MODEL FOR ASSESSING THE

FISCAL YEAR 1986

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PROGRAM COSTS OF SPACE LAUNCH SYSTEMS IS PROPOSED. PARAMETRIC COST MODELS WILL BE DEVELOPED FOR BOTH EXPENDABLE LAUNCH VEHICLES AND REUSABLE VEHICLES (I.E. THE SHUTTLE). A DETAILED COST DATA BASE FOR LAUNCH VEHICLES WILL BE GENERATED; AND WILL INCLUDE NOT ONLY RAW COST DATA BUT INFORMATION ON NON-TECHNOLOGICAL FACTORS AFFECTING THOSE COSTS. COST DATA WILL BE APPROPRIATELY NORMALIZED TO CORRECT FOR THESE FACTORS. AN IN-DEPTH DATA BASE ON THE TECHNOLOGICAL AND PERFORMANCE CHARACTERISTICS OF U.S. AND FOREIGN LAUNCH VEHICLES WILL ALSO BE GENERATED. THE NORMALIZED COST DATA AND TECHNICAL DATA WILL BE CORRELATED TO ESTABLISH MATHEMATICAL RELATIONSHIPS BETWEEN COSTS AND UNDERLYING TECHNICAL PARAMETERS. COST ESTIMATING RELATIONSHIPS WILL BE ESTABLISHED AT THE MAJOR SUBASSEMBLY AND SUBSYSTEM LEVEL. MAJOR COST COMPONENTS WILL THEN BE BUILT UP TO TOTAL VEHICLE COSTS. A FIRST-ORDER IMPLEMENTATION OF THE RESULTING ALGORITHMS WILL BE PROVIDED ON A MICROCOMPUTER. THE MODEL WILL ALLOW ANALYSTS TO INDEPENDENTLY ESTIMATE THE DEVELOPMENT AND OPERATIONS COST OF PROPOSED LAUNCH SYSTEMS, OR OF ALTERNATIVE PROCUREMENT RATES FOR SUCH SYSTEMS, BEFORE MAKING MAJOR PROGRAM COMMITMENTS. THIS WILL ALLOW MORE EFFICIENT UTILIZATION OF SCARCE AIR FORCE RESOURCES.

BIO-METRIC SYSTEMS INC  
9932 W 74TH ST  
EDEN PRAIRIE, MN 55344  
DR PETER H DUQUETTE

NAVY

\$ 89,344

## TITLE:

CHEMICAL INTELLIGENCE FOR AUTOMATED SYSTEMS: CHEMILUMINESCENT  
ENZYME IMMUNO ASSAY DEVICE FOR TOXINS

T 2 OFFICE: ONR

A FEASIBILITY DEMONSTRATION PLAN IS PROPOSED FOR THE AFFINITY IMMOBILIZATION OF NON-CONSUMMABLE COMPONENTS OF A HOMOGENEOUS ENZYME IMMUNOASSAY SYSTEM, IN A FUNCTIONAL ARRANGEMENT WITH ONE ANOTHER ON A SILICA-BASED SENSOR SURFACE. THE BIOMEMBRANE CHEMICAL SENSOR DEVICE TO BE DEVELOPED THEREFROM, IS EXPECTED TO BE A FIELDABLE (SMALL AND RUGGED WITH LOW POWER AND CONSUMMABLE MATERIAL REQUIREMENTS) MULTI-ANALYTE CBT MICROSENSOR PROVIDING SPECIFIC SENSITIVE AND CONTINUOUS (REAL-TIME) MONITORING FOR AT LEAST 24 HOURS WITHOUT MAINTENANCE. THE BIOACTIVE MEMBRANE COMPONENTS WILL BE READILY REPLACEABLE. THE DEVICE WILL REVERSIBLY RESPOND TO AND TRANSDUCE THE AGENT BINDING EVENT WITH CAPABILITY FOR DETECTION AND ELEMENTARY RECORDING AND TRANSMISSION OF SIGNAL DATA.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
BIOELECTRONICS 25091 ARMAGOSA DR LAGUNA NIGUEL, CA 92677 PETER JOHNSON TITLE: HIGH POWER MISSILE BATTERY T 262 OFFICE: BMO/MYSC	AF	\$ 48,910

THE PROPOSAL OBJECTIVES ARE, TO RESEARCH AND DESIGN (R&D) A COMPACT ENERGY SOURCE FOR MISSILE APPLICATION THAT CAN PROVIDE HIGH POWER OUTPUT DENSITY DURING A 2 TO 5 MINUTE ACTIVE LIFE. ELECTRODE KINETICS AND DYNAMICS DURING THE HIGH POWER TRANSIENT STATE UNDER THE INFLUENCE OF MISSILE ENVIRONMENTS, WILL BE RESEARCHED TO PROVIDE A BATTERY SYSTEM CAPABLE OF RAPID AND HIGH POWER DISCHARGE.

BIOTEK INC 21-C OLYMPIA AVE WOBURN, MA 01801 DR MICHAEL H GAY TITLE: ANTIMICROBIAL WOUND DRESSING T 214 OFFICE: AMRDC/SGRD	ARMY	\$ 50,000
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COMBAT WOUNDS ARE CHARACTERIZED BY A HIGH INCIDENCE OF INFECTION. TOPICAL APPLICATION OF BROAD SPECTRUM ANTIMICROBIAL AGENTS BY SUSTAINED RELEASE SYSTEM CAN PROVIDE THERAPEUTIC LEVELS FOR A PROLONGED PERIOD WITH MINIMAL SYSTEMIC TOXICITY. BIOTEK IS DEVELOPING A WOUND DRESSING BASED ON THIS CONCEPT. THE OBJECTIVE OF THIS PHASE I PROJECT IS TO DEMONSTRATE THE FEASIBILITY OF AN ANTIMICROBIAL WOUND DRESSING BASED ON A POROUS FILM OR HYDROGEL SUSTAINED RELEASE MATRIX. SPECIFICALLY SEVERAL SUSTAINED RELEASE MATRIXES WILL BE PREPARED CONTAINING CHLORHEXIDINE DIPHOSPHANILATE AND TETRACYCLINE. DEGREE OF HYDRATION, MORPHOLOGY BY SCANNING ELECTRON MICROSCOPY, AND IN VITRO DRUG RELEASE WILL BE STUDIED FOR EACH MATRIX. THE MOST PROMISING PREPARATIONS WILL BE EVALUATED FOR IN VIVO EFFICACY AND IN VIVO DRUG RELEASE. DURING PHASE II FURTHER IN VITRO AND IN VIVO TESTING WILL BE REQUIRED TO OPTIMIZE THE FORMULATIONS. TOXICOLOGY STUDIES WILL BE CONDUCTED, PRODUCT AND PRODUCTION SPECIFICATIONS ESTABLISHED, AND AN IND APPLICATION FILED. INDUSTRIAL SUPPORT WILL THEN BE SOUGHT TO

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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CONDUCT CLINICAL TRIALS AND TO COMMERCIALIZE THE CONCEPT.

BISMARCK INC 1102 BISMARCK WY KING OF PRUSSIA, PA 19406 JOHN J MEANY JR TITLE: THRESHOLD CORROSION FATIGUE TO WELDED SHIPBUILDING STEELS T 47 OFFICE: NAVSEA	NAVY	\$ 39,187
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UNDER THE SLOW FREQUENCY AND LONG LIFE CONDITIONS THAT ARE OF INTEREST IN A NUMBER OF ENGINEERING APPLICATIONS THAT INVOLVE CYCLIC LOADING AND ENVIRONMENTAL EXPOSURE (OFFSHORE OIL PLATFORMS, SUBMARINES, SURFACE SHIPS), THE ACQUISITION OF FCGR DATA IN THE NEAR-THRESHOLD REGIME IS ESPECIALLY DIFFICULT BECAUSE ACCURATE CRACK MEASUREMENTS ARE REQUIRED OVER RELATIVELY LONG-TERM EXPOSURE PERIODS IN AN AGGRESSIVE ENVIRONMENT (SEAWATER). FURTHERMORE, THERE IS A DEARTH OF SUCH DATA, PARTICULARLY UNDER SLOW FREQUENCY AND LONG LIFE CONDITIONS. SUCH DATA IS ESSENTIAL FOR PREDICTING LONG-TERM STRUCTURAL PERFORMANCE. THE FOLLOWING IS A PROPOSAL TO DEVELOP A COMPUTER-ENHANCED FCGR TESTING METHODOLOGY THAT WILL PERMIT ACQUISITION OF ACCURATE, RELIABLE FCGR DATA UNDER PERTINENT ENVIRONMENTAL CONDITIONS AND IN PRACTICAL TIME FRAMES.

BISTA RESEARCH INC 22A SPARROW HAWK CT GREER, SC 29651 DR KARL M BYSTRICKY TITLE: A MINIATURE EXPENDABLE ZOOM LENS ASSEMBLY FOR A REMOTELY PILOTED VEHICLE STUDY T 154 OFFICE: NAVAIR/NADC	NAVY	\$ 31,737
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PHASE 1 STUDY OF THE FEASIBILITY OF DEVELOPING A ZOOM LENS AS DESCRIBED IN SBIR TOPIC N86-154 IS PROPOSED. THE OBJECTIVE OF THIS STUDY IS TO INVESTIGATE ALTERNATIVE CONFIGURATIONS TO FIND THE ONE MOST EFFECTIVE IN MINIMIZING PRODUCTION COST, SIZE, AND WEIGHT WHILE OFFERING APPROPRIATE OPTICAL CHARACTERISTICS AND PERFORMANCE. REMOTELY ADJUSTABLE FOCAL LENGTH OF 11 TO 100 MM, APERTURE OF 1.8 TO 2.8, AND FIELDS COMMENSURATE WITH MAPPING AND COMMERCIAL AERIAL PHOTOGRAPHY.

FISCAL YEAR 1986

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SQUARE CCD DETECTOR ARRAYS OF 60 mm BARREL LENGTH WILL BE TAKEN AS TYPICAL SPECIFICATIONS SUBJECT TO REFINEMENT DURING DISCUSSIONS WITH COGNIZANT NAVY PERSONNEL FOLLOWING CONTRACT AWARD. CONFIGURATIONS TO BE STUDIED WILL BE CHOSEN FROM THE WIDE EXPERIENCE OF THE PRINCIPAL INVESTIGATOR IN THE DESIGN, PRODUCTION, AND QUALITY CONTROL OF COMMERCIAL IN THE DESIGN, PRODUCTION, AND QUALITY CONTROL OF COMMERCIAL CINEMATOGRAPHIC ZOOM LENSES AND OF SPECIALIZED OPTICS FOR MILITARY APPLICATIONS. KEY DESIGN CONSIDERATIONS INCLUDE ABERRATION BALANCE.

BKM INC  
5141 SANTA FE ST  
SAN DIEGO, CA 92109  
N J BECK

ARMY

\$ 49,908

TITLE:

FUEL INJECTION RETROFIT FOR IMPROVED DIESEL ENGINE PART LOAD PERFORMANCE

T 114

OFFICE: TACOM/AMSTA

A CONVENTIONAL DIESEL FUEL INJECTOR, WHICH CONSISTS OF A CAM ACTUATED PLUNGER AND SPRING LOADED NOZZLE VALVE, IS DESIGNED TO DELIVER RATED SPEED AND FULL LOAD FUEL REQUIREMENTS AT A PRESSURE LEVEL THAT WILL PROVIDE SATISFACTORY ATOMIZATION AND SPRAY PATTERN. AT REDUCED SPEED AND/OR ENGINE LOAD, THE INJECTION PRESSURE, WHICH IS A FUNCTION OF THE QUANTITY, AND PLUNGER SPEED, IS DRAMATICALLY REDUCED FROM RATED CONDITIONS, RESULTING IN POOR ATOMIZATION AND COMBUSTION. THE BKM SERVOJET SYSTEM, CURRENTLY UNDER DEVELOPMENT, EMPLOYS THE ACCUMULATOR PRINCIPLE WITH A TRIGGERED RELEASE. AS A RESULT, THE INJECTION IMPINGEMENT PRESSURE IS INDEPENDENT OF ENGINE SPEED AND WILL ALWAYS BE AT A LEVEL THAT PROVIDES GOOD ATOMIZATION AND AVOIDS THE DRIBBLING AT LOW LOADS THAT CAUSES SMOKE "WET STACKING", AND HIGH FUEL CONSUMPTION. IT IS PROPOSED THAT A TYPICAL DIESEL ENGINE BE SELECTED FOR MODIFICATION OF THE CONVENTIONAL UNIT INJECTOR SYSTEM TO INCORPORATE THE ACCUMULATOR AND HIGH PRESSURE FEATURES OF THE SERVOJET SYSTEM TOGETHER WITH SOME NEW THEORIES TO INJECTION SPRAY PRESENTLY BEING INVESTIGATED. THE PLAN IS TO DESIGN AND MANUFACTURE A SET OF INJECTORS FOR THE FUTURE, AND TO TEST AT VARIOUS LOADS AND SPEEDS, IN ORDER TO DETERMINE THE IMPROVEMENT IN FUEL CONSUMPTION, SMOKE, AND OTHER OPERATING PARAMETERS.

FISCAL YEAR 1986

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BONNEVILLE SCIENTIFIC INC 918 E 900 SO SALT LAKE CITY, UT 84105 DR ALLEN R GRAHN TITLE: EMULATION AND FABRICATION OF NONAVAILABLE MICROCIRCUITS T 70 OFFICE: NDSC/SUP	NAVY	\$ 50,000

THE PRIMARY FOCUS OF THIS SBIR PROJECT IS THE RESEARCH FOR THE DEVELOPMENT OF A TECHNOLOGY FOR DESIGNING AND FABRICATING NON-AVAILABLE MICROCIRCUITS USING STATE-OF-THE-ART CMOS PROCESSES. THE RESEARCH IS AIMED AT KEEPING THE NON-RECURRING ENGINEERING (NRE) COSTS ASSOCIATED WITH BOTH DESIGN AND FABRICATION LOW. DESIGN COSTS FOR THE PARTS WILL BE KEPT LOW BY USING A MODIFIED VERSION OF A METHODOLOGY KNOWN AS PATH PROGRAMMABLE LOGIC (PPL) WHICH HAS BEEN DEVELOPED WITH SUPPORT FROM DARPA BY THE VLSI GROUP AT THE UNIVERSITY OF UTAH AND LICENSED TO BONNEVILLE SCIENTIFIC, INC. MANUFACTURING COSTS WILL BE KEPT LOW FOR THE SMALL QUANTITIES REQUIRED BY USING MULTICHIP FABRICATION TECHNIQUES WHERE SEVERAL DIFFERENT CIRCUITS WILL BE MADE WITH ONE MASK SET. THE FABRICATION FUNCTION WILL BE IMPLEMENTED THROUGH DARPA'S MOSIS SYSTEM WHICH IS INITIATING A NEW PROCESSING CONSISTANCY PROGRAM TO ACHIEVE THE CONTROL OF DEVICE SPECIFICATIONS NECESSARY FOR THIS PROJECT.

BREUER & ASSOC 3716 S HOPE ST - #300/URBAN UNIV CTR LOS ANGELES, CA 90007 MAGDY ABADIR TITLE: EXPERT SYSTEM FOR INSURING DESIGN FOR TESTABLE DESIGNS T 151 OFFICE: NWSC	NAVY	
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THE COMPLEXITY OF VLSI CIRCUITS MAKES  
A VERY COMPLEX AND COSTLY FABRICATION  
ABILITY TECHNIQUES EXIST AND THE  
PROPOSAL DEALS WITH ASPECTS OF  
AND A DESIGNER IN FABRICATING  
TEST PROGRAMS TO BE USED IN  
FABRICATING AND TESTING  
MULTI-CHIP CIRCUITS.



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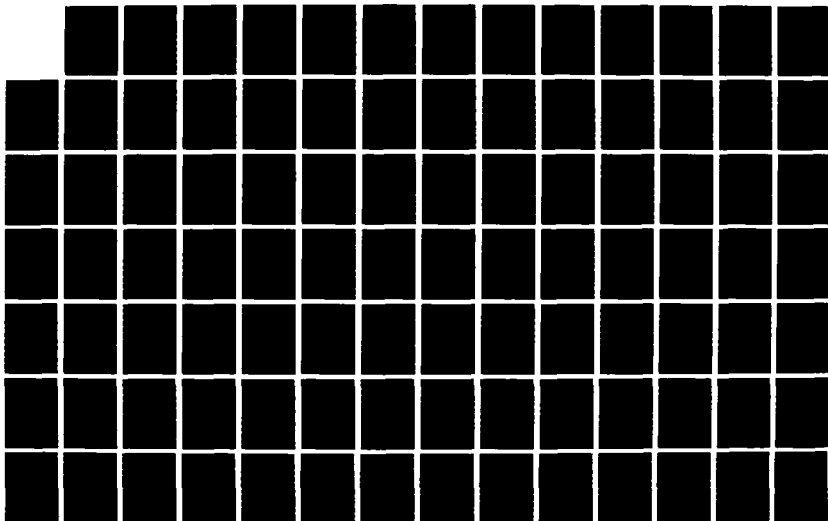
DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
(SBIR) ABSTRACTS OF PHASE I AWARDS <1986>(U) DEPARTMENT  
OF DEFENSE WASHINGTON DC 1986

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NATIONAL BUREAU OF STANDARDS-1963-A

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>ALLY EMBEDDING THESE TECHNIQUES INTO A CHIP BEING DESIGNED. NEW TEST TECHNIQUES, AS THEY ARE INVENTED BY TEST EXPERTS, CAN BE EASILY ADDED TO THE SYSTEM BY TEST EXPERTS. THE PROPOSED WORK DEALS WITH 4 KEY TASKS: (1) DEFINING A SYSTEM ARCHITECTURE FOR SUCH AN EXPERT SYSTEM, (2) DETERMINING A SET OF BIT STRUCTURES AND THEIR CHARACTERISTICS USEFUL FOR GATE ARRAY CIRCUITS; (3) DETERMINING WAYS TO CALCULATE VALUES FOR MEASURES FOR TEST TECHNIQUES SO THAT AN INTELLIGENT SELECTION BETWEEN TECHNIQUES CAN BE MADE; AND (4) DEVELOPING WAYS TO PARTITION A CIRCUIT SO THAT EACH PARTITION CAN BE MADE TESTABLE.</p>		

BREWER SCIENCE INC PO BOX GG - 2401 HIGH TECH DR ROLLA, MO 65401 DR TERRY BREWER TITLE: ORGANIC SEMICONDUCTORS FOR MICROELECTRONIC CIRCUITS PROCESSING T 12 OFFICE: DARPA	DARPA	\$ 49,710
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SEMICONDUCTING ORGANIC MATERIALS WILL BE TESTED FOR THEIR PROCESSABILITY IN INTEGRATED CIRCUIT MANUFACTURING. THE MATERIALS TO BE TESTED INCLUDE POLYPHENYLENE, POLYPHTHALOCYANINES, POLYACRYLONITRILES, TETRATHIAFULVENE HALIDES, AND POLYSILASTYRENE. THESE MATERIALS, WHEN PROPERLY DOPED, HAVE GOOD ELECTRICAL CONDUCTIVITIES AS WELL AS MAINTAINING EXCELLENT THERMAL STABILITY OF 400 DEG C. RATHER THAN DEVISING NEW CIRCUITS, THE WORK WILL LOOK AT INCORPORATING THE POLYMER INTO EXISTING STATE OF THE ART SILICON TECHNOLOGY. SPECIAL MODERN METALLIZATION TECHNIQUES AND ION ETCHING TECHNIQUES WILL BE EVALUATED WITH THE POLYMERS. PHASE I WILL ALSO FORM THE POLYMERS AS PARTS OF SIMPLE CAPACITORS AND RESISTORS, AND TEST FOR CONDUCTIVITY AND OHMIC CONTACT. TESTS OF THEIR FILM-FORMING CAPABILITY WILL BE EXAMINED AS WELL AS THE ABILITY TO BE PATTERNED BY PHOTOLITHOGRAPHY OR ELECTRON-BEAM LITHOGRAPHY.

BREWER SCIENCE INC PO BOX GG - 2401 HIGH TECH DR ROLLA, MO 65401 DR TERRY BREWER TITLE: CORRELATION OF POLYIMIDE RESIN MECHANICAL PROPERTIES WITH POLYMERIC PHYSICAL PROPERTIES T 166 OFFICE: AFWAL/ML	AF	\$ 49,377
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THIS PROJECT IS A STUDY OF THE EFFECTS OF POLYMERIC PHYSICAL PRO-

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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PERTIES ON NEAT RESIN MECHANICAL PROPERTIES. THE POLYMER CHOSEN FOR THIS STUDY IS A POLYIMIDE SULFONE FORMED FROM BENZOPHENONE TETRA-CARBOXYLIC DIANHYDRIDE (BTDA) AND 3,3'-DIAMINODIPHENYLSULFONE (DDS). DURING PHASE I, SAMPLES OF POLYIMIDE SULFONE OF DIFFERENT MOLECULAR WEIGHTS, PURITIES, AND CURING SCHEDULES WILL BE SYNTHESIZED. THE SAMPLES WILL BE ANALYZED TO DETERMINE MOLECULAR WEIGHT AND DISTRIBUTION, AND GLASS TRANSITION TEMPERATURES. TWO MECHANICAL PROPERTIES THAT CAN BE CORRELATED TO THE POLYMER'S PERFORMANCE IN A COMPOSITE, TENSILE STRESS-STRAIN AND FRACTURE TOUGHNESS, WILL BE MEASURED. THERMOMECHANICAL ANALYSES WILL BE PERFORMED. THE OBJECTIVE OF PHASE I WILL BE TO DETERMINE IF THE ABOVE MECHANICAL PROPERTIES ARE SENSITIVE TO MOLECULAR WEIGHT, MOLECULAR WEIGHT DISTRIBUTION, PURITY, AND CURING SCHEDULES. IF SO, THIS INFORMATION WILL BE USED AS A BASIS FOR FURTHER IMPROVEMENT AND MECHANICAL TESTING DURING PHASE II.

BRIMROSE CORP OF AMERICA  
7720 BELAIR RD  
BALTIMORE, MD 21236  
DR RONALD G ROSEMEIER

SDIO \$ 98,876

## TITLE:

2-D ACOUSTO-OPTIC HIGH POWER LASER BEAM DEFLECTOR DEVELOPMENT  
(NO MIRRORS)

T 3 OFFICE:

THIS PROPOSAL IS A UNIQUE AND INNOVATIVE APPROACH TO CONSTRUCTING 2-D GaAs ACOUSTO-OPTIC LIGHT DEFLECTORS FOR HIGH POWER LASER APPLICATIONS WITHOUT THE USE OF MIRRORS. ADVANTAGES OF SUCH SYSTEM OVER CONVENTIONAL LASER BEAM MIRRORS ARE THE INABILITY OF MIRRORS TO DEFLECT AT HIGH SPEEDS DUE TO THE MIRROR'S INERTIA. AS A RESULT WITH ELECTRONIC ACOUSTO-OPTIC DEVICES, THEIR PERFORMANCE AND HENCE SPEED IS THAT OF THE ORDER OF ELECTRONIC SWITCHING. ALSO MIRRORS REQUIRE LARGE POWER CONSUMPTIONS WHEREBY ACOUSTIC RF POWER GENERATIONS ARE SIGNIFICANTLY LESS. AN ADVANTAGE OF CONSTRUCTING ACOUSTO-OPTIC LASER BEAM DEFLECTORS IS THAT DEFLECTION ANGLE IS PROPORTIONAL TO THE FREQUENCY. FOR EXAMPLE, WITH PRESENT BRIMROSE ACOUSTO-OPTIC DEVICES LASER BEAM DEFLECTION ANGLES ARE TYPICALLY 6-12 DEG GHz. IN THE LAST THREE YEARS, BRIMROSE HAS BEEN A PIONEER IN DESIGNING AND CONSTRUCTING ACOUSTO-OPTIC LASER BEAM DEFLECTORS. IN 1984, WE WERE THE FIRST COMPANY TO COMMERCIALY INTRODUCE A 1-D 40% DIFFRACTION EFFICIENCY LASER BEAM DEFLECTOR FROM GALLIUM PHOSPHIDE (GaP) THAT OPERATES AT 1 GHz CENTER FREQUENCY WITH A DEFLECTION ANGLE OF 10 DEGREES FOR A

FISCAL YEAR 1986

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HeNe LASER. BRIMROSE WOULD LIKE TO EXPLORE THE POSSIBILITY OF USING OUR PROPRIETARY FABRICATION TECHNOLOGY TO CONSTRUCT 2-D LASER BEAM DEFLECTOR FOR HIGH POWERED Nd:YAG (1.06 MICROMETERS) LASER APPLICATIONS. ALSO, IT SHOULD BE NOTED THAT THIS TECHNOLOGY WITH MODIFICATIONS CAN BE USED FOR FABRICATING AN OPTICAL COMPUTER WITH SPEEDS GREATER THAN THE PRESENT STATE-OF-THE-ART CRAY COMPUTERS.

BRIMROSE CORP OF AMERICA	ARMY	\$ 52,894
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7720 BELAIR RD

BALTIMORE, MD 21236

DR RONALD G ROSEMEIER

TITLE:

RAPID ANALYTICAL QUALITY CONTROL TECHNIQUES FOR ENERGETIC MATERIALS

T 3 OFFICE: ARDC/SMCAR

NUMEROUS STUDIES HAVE BEEN CONDUCTED INTO THE MICROSTRUCTURAL ORIGIN OF THE INSTABILITY AND UNPREDICTABILITY OF VARIOUS ENERGETIC MATERIALS. SOME OF THESE MATERIALS ARE RDX/HMX, AMMONIUM PERCHLORATE, ALUMINUM, ETC. MANY TECHNIQUES BOTH DESTRUCTIVE AND NON-DESTRUCTIVE HAVE SO FAR BEEN UTILIZED IN AN ATTEMPT TO QUANTIFY THE ENERGETIC PROPERTIES OF THEIR COMPOSITES. THESE COMPOSITES MAY CONTAIN ONE OR MORE ENERGETIC CONSTITUENTS IN AN ELASTOMERIC BINDER. NON-DESTRUCTIVE X-RAY CHARACTERIZATION TECHNIQUES HAVE BEEN SUCCESSFULLY EMPLOYED TO MEASURE SEVERAL MICROSTRUCTURAL PARAMETERS. PREVIOUS STUDIES CONDUCTED AT BRIMROSE AND RUTGERS IN CONJUNCTION WITH NSWC HAVE SHOWN CONSIDERABLE DIFFERENCES AMONG VARIOUS PRODUCTION GRADE RDX. THESE STUDIES REVEAL MARKED DIFFERENCES IN THE AMOUNTS OF RESIDUAL ELASTIC STRAIN AND THE DISTRIBUTION OF DISLOCATIONS (RESIDUAL PLASTIC STRAIN) IN THE CONSTITUENT RDX PHASE. ADDITIONALLY, X-RAY DIFFRACTOMETRY CAN BE USED TO RAPIDLY QUANTIFY THE CONSTITUENT COMPOSITION IN COMPOSITED. THE PROPOSED PHASE I STUDY IS TO ASCERTAIN THE FEASIBILITY OF APPLYING THE NEWLY DEVELOPED BRIMROSE AUTOMATED X-RAY DIFFRACTION TECHNIQUES TO PRODUCTION QUALITY CONTROL OF ENERGETIC MATERIALS AND COMPOSITES. THESE METHODS UTILIZE ADVANCE DIGITAL DATA ACQUISITION AND PROCESSING TECHNIQUES. THE MENU-DRIVEN, "TURN-KEY" SOFTWARE DESIGN REDUCES ANALYSIS TIME AND ALSO MINIMIZES THE REQUIRED OPERATOR TRAINING AND INTERVENTION.

BRIMROSE CORP OF AMERICA	NAVY	\$ 68,574
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7720 BELAIR RD

BALTIMORE, MD 21236

DR RONALD G ROSEMEIER

TITLE:

UNIQUE TECHNIQUE FOR REAL TIME CHARACTERIZATION OF RDX/HMX BASED COMPOSITES

T 128 OFFICE: NWC/SSPO

NUMEROUS STUDIES CONDUCTED IN THE PAST HAVE CLEARLY ESTABLISHED THE

FISCAL YEAR 1986

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STRONG CORRELATION BETWEEN THE MICROSTRUCTURE AND THE ENERGETIC PROPERTIES OF SOLID PROPELLANTS SUCH AS RDX, HMX, Al, NH<sub>4</sub>ClO<sub>4</sub>, ETC. THE PRESENT STUDY WILL EXAMINE THE FEASIBILITY OF USING A NON-CONTACT, NON-DESTRUCTIVE X-RAY TECHNIQUE DEVELOPED UNDER CURRENT ONR SPONSORSHIP FOR SUCCESSFULLY CHARACTERIZATING SOLID PROPELLANT COMPOSITES. THIS TECHNIQUE UTILIZES A STATE-OF-THE-ART X-RAY DETECTOR SYSTEM FOR SIMULTANEOUSLY OBSERVING SEVERAL CONSTITUENT PHASES AND THEIR RELATIVE COMPOSITION IN COMPOSITE MIXTURES. X-RAY DIFFRACTOMETRY A WELL ESTABLISHED MICROSTRUCTURAL CHARACTERIZATION TOOL WILL BE THE FOCUS OF THIS STUDY. THE TECHNIQUE IN CONJUNCTION WITH THE POSITION SENSITIVE DETECTOR (PSD) SYSTEM AND POWERFUL COMPUTERS CAN BE VERY EFFECTIVELY USED TO CHARACTERIZE SOLID PROPELLANT COMPOSITES IN REAL TIME. PHASE II WILL FOCUS ON DESIGNING AND FABRICATING SUCH A SYSTEM FOR PRODUCTION LINE APPLICATION TO MONITOR MATERIAL MICROSTRUCTURE IN REAL TIME.

BROWN J ASSOCS INC	AF	\$ 48,384
PO BOX 145		
BERKELEY HEIGHTS, NJ 07922		
DR JOHN A BROWN		
TITLE:		
FUEL TANK ULLAGE VAPOR ANALYZER		
T 125	OFFICE: AFWAL/FI	

THE VAPOR SPACE INSIDE AN AIRCRAFT FUEL TANK EITHER IS OR IS NOT FLAMMABLE (OR EXPLOSIVE) DEPENDING UPON THE PERCENTAGE OF FUEL VAPOR AND OF OXYGEN OF INERT GAS SUCH AS NITROGEN OR CARBON DIOXIDE. IT IS IMPORTANT TO KNOW THESE PERCENTAGES WHEN TESTING THE EFFICACY OF EXPERIMENTAL INERTING MEASURES BY FIRING LIVE ROUNDS AT TEST TANKS; BUT THERE IS NO FAST, CONVENIENT, FIELD METHOD OF MEASURING THE PERCENTAGES. THIS PROJECT PROPOSES TO ASSESS THE FEASIBILITY OF MEASURING THE PERCENTAGES OF FUEL VAPOR, OXYGEN, NITROGEN AND PERHAPS CARBON DIOXIDE IN REAL TIME OUT IN THE FIELD BY A COMBINATION OF TWO INNOVATIVE GAS CHROMATOGRAPHS THAT HAVE BEEN DEVELOPED IN THIS LABORATORY. THE INNOVATION LIES PARTLY IN CIRCUITRY THAT CONFERS BASELINE STABILITY AND ALMOST INSTANT WARM-UP, AND PARTLY IN ENGINEERING OF THE SEPARATION COLUMNS. THE TWO CHROMATOGRAPHS HAVE BEEN WELL DEMONSTRATED SEPARATELY, BUT THE FEASIBILITY OF COMBINING THEM INTO A FIELD PACKAGE REMAINS TO BE SHOWN.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
BUSINESS & TECHNOLOGICAL SYSTEMS INC 10210 GREENBELT RD - STE 440 SEABROOK, MD 20706 EDWARD N KHOURY TITLE: RADAR ALGORITHMS FOR RV DISCRIMINATION T 3 OFFICE:	SDIO	\$ 49,114

THE WORK PROPOSED HEREIN WILL ESTABLISH THE FEASIBILITY OF USING PSEUDO-BAYES DISCRIMINATION TO SEPARATE RV'S FROM DECOYS. THE PSEUDO-BAYS DISCRIMINATOR WILL REQUIRE THE PROBABILITY DENSITY OF THE RECEIVED SIGNATURE AND POSITION DATA CONDITIONED ON A SPECIFIC RV OR DECOY BODY. THIS, I TURN, DEPENDS ON BODY PARAMETERS AS WELL AS THE TWELVE (12) INITIAL CONDITIONS ASSOCIATED WITH THE BALLISTIC TRAJECTORY. BUSINESS AND TECHNOLOGICAL SYSTEMS, INC. (BTS) HAS PREVIOUSLY DEVELOPED THE REENTRY VEHICLE PARAMETER IDENTIFICATION (RVPI) ALGORITHM TO ESTIMATE THESE PARAMETERS. DURING THE PHASE I EFFORT, THE FEASIBILITY OF USING A MODIFIED VERSION OF THIS PROGRAM TO PERFORM RV/DECOY DISCRIMINATION WILL BE ASSESSED.

BUSINESS & TECHNOLOGICAL SYSTEMS INC 10210 GREENBELT RD - STE 440 SEABROOK, MD 20706 JAMES S VANDERGRAFT TITLE: COMPUTER NETWORK EVALUATION TOOL T 9 OFFICE:	SDIO	\$ 46,399
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RECENTLY, A NEW TECHNIQUE FOR MODELING THE FLOW OF DATA THROUGH AN INFORMATION PROCESSING SYSTEM HAS BEEN DEVELOPED. IT HAS, HOWEVER, BEEN SUBJECTED TO ONLY VERY LIMITED TESTING ON ACTUAL COMPUTER NETWORKS. THIS TESTING HAS SHOWN THAT THE TECHNIQUE, BASED ON ANALYZING THE INFORMATION FLOW AS A FLUID FLOW, IS MORE WIDELY APPLICABLE THAN VARIOUS APPROXIMATION METHODS BASED ON QUEUEING THEORY IDEAS. AT THE SAME TIME, IT IS EASIER TO APPLY AND LESS COSTLY TO EXERCISE THAN DISCRETE EVENT SIMULATION METHODS. FOR THESE REASONS, IT SHOULD BE AN IDEAL METHOD FOR ANALYZING, EVALUATING AND FINETUNING ANY OF THE COMPUTER SYSTEMS OR DATA NETWORKS THAT ARE PART OF THE SDI SYSTEM. IT COULD BE APPLIED TO THE ENTIRE SDIO BM/C(3) SYSTEM, OR TO JUST THE DATA FLOW AND DATA PROCESSING OF THE LARGE SCALE EXPERIMENTS CONDUCTED BY SDIO. THE OBJECTIVES OF THIS PROJECT ARE TWOFOLD; FIRST

FISCAL YEAR 1986

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AWARDED  
AMOUNT

TO SHOW THAT THIS NEW METHOD CAN BE EFFECTIVELY USED TO ANALYZE INFORMATION SYSTEMS OF THE TYPE THAT WILL ARISE IN THE SDIO AND SECOND, TO STUDY THE FEASIBILITY OF DESIGNING A USER INTERFACE THAT WILL ALLOW A SYSTEMS ANALYST TO APPLY THE TOOL WITHOUT HAVING TO UNDERSTAND ALL THE DETAILS OF HOW IT WORKS.

BUSINESS & TECHNOLOGICAL SYSTEMS INC  
10210 GREENBELT RD - STE 440  
SEABROOK, MD 20706  
THOMAS S ENGLAR JR

SDIO

\$ 49,631

TITLE:

DECENTRALIZED TRACKING/CORRELATION

T 9 OFFICE:

A CRUCIAL REQUIREMENT FOR SUCCESSFUL BATTLE MANAGEMENT IN A BALLISTIC MISSILE DEFENSE (BMD) SYSTEM IS PERFORMANCE OF THE TRACKING/CORRELATION FUNCTION. DUE TO THE FACT THAT THE DEFENSE SYSTEM ITSELF MAY BE UNDER ATTACK, IT IS IMPORTANT TO USE A DECENTRALIZED TRACKING/CORRELATION ARCHITECTURE TO ENHANCE SURVIVABILITY. IN A DECENTRALIZED SCHEME, INDIVIDUAL SENSORS CORRELATE SENSOR DATA WITH OBJECTS AND TRACK THEM INDEPENDENTLY FROM THE OTHER SENSORS. COMPLETE TRACKS ARE SENT BY THE SENSORS TO THE WEAPON PLATFORM FOR A HIGHER LEVEL CORRELATION OF TRACKS WITH TRACKS AND MORE REFINED TRACKING (THE TRACK FUSION FUNCTION). THIS ALSO REDUCES COMMUNICATION RATES BECAUSE TRACKS ARE BEING COMMUNICATED RATHER THAN ALL THE DATA. THE MAJOR INNOVATION PROPOSED IS TO DEVELOP A DECENTRALIZED TRACK/CORRELATION APPROACH BASED ON A NOVEL DECENTRALIZED SQUARE ROOT INFORMATION FILTER (SRIF) RECENTLY DEVELOPED BY DR. G.J. BIERMAN AND BTS. THE DECENTRALIZED SRIF OFFERS THE POTENTIAL OF GREATLY IMPROVED COMPUTATIONAL BURDEN AND NUMERICAL CONDITIONING RELATIVE TO EXISTING APPROACHES. FURTHERMORE, IT HAS THE POTENTIAL OF EFFICIENTLY HANDLING MULTIPLE SENSOR DATA RATES, WHICH EXISTING TECHNIQUES HAVE TROUBLE WITH.

BUSINESS & TECHNOLOGICAL SYSTEMS INC  
10210 GREENBELT RD - STE 440  
SEABROOK, MD 20706  
DAVID E MATZKE

ARMY

\$ 43,056

TITLE:

PARAMETRIC PERFORMANCE ANALYSIS OF A PASSIVE SINGLE SITE TARGET  
RANGING ALGORITHM FOR ESM TRACKERS

T 60 OFFICE: CECOM/AMSEL

OFFERED HERE IS A PARAMETRIC STUDY OF AN ALGORITHM FOR DETERMINING



FISCAL YEAR 1986

SUBMITTED BY

DEPT

AWARDED  
AMOUNT

TARGET RANGE FROM A SEQUENCE OF TARGET DIRECTION ANGLES AND TARGET EMISSION FREQUENCIES AS ACQUIRED AT A SINGLE-SITE, PASSIVE ESM RECEIVER FACILITY. THE ALGORITHM, WHICH FORMALLY ADJOINS THE LATERAL INFORMATION CONTENT OF THE ANGULAR DATA TO THE RADIAL INFORMATION CONTENT OF THE FREQUENCY DATA, WAS SUCCESSFULLY DEVELOPED TO ENABLE THE PASSIVE SONAR TARGETING OF HOSTILE SUBMARINES BY OUR OWN. IT CAN BE EASILY ADAPTED TO THE PASSIVE, SINGLE-SITE ESM CASE. ITS PRACTICAL UTILITY IS TO BE ASSESSED BY THE GRAPHICAL PLOTTING OF SUCH PERFORMANCE ATTRIBUTES AS ONE-SIGMA RANGE ERROR VERSUS SUCH ESM TRACKING ATTRIBUTES AS (a) ANGULAR SPAN, (b) TIME SPAN, (c) FREQUENCY SPAN, (d) ANGULAR AND FREQUENCY ERROR VARIANCES, (e) SPAN GEOMETRY, (f) DATA RATE, AND (g) OMISSION OF EVALUATION DATA, TROPOSPHERIC REFRACTION. TIME AND ACCURACY WISE, IT IS KNOWN THAT THIS TECHNIQUE CANNOT COMPETE WITH AN ACTIVE RADAR. HOWEVER, IT IS PASSIVE AND, IN ADDITION TO RANGE, ESTIMATES THE COMPLETE TARGET STATE VECTOR. RELATIVE TO TRIANGULATION METHODS, IT OFFERS THE CONSIDERABLE ADVANTAGE OF SINGLE-SITE AUTONOMY.

CAMBRIDGE ANALYTICAL ASSOCS

AF

\$ 50,000

1106 COMMONWEALTH AVE

BOSTON, MA 02215

SAMUEL FOGEL

TITLE:

BIODEGRADATION OF JET FUEL IN GROUNDWATER

T 297

OFFICE: AFESC/RDXP

GROUND WATER AT SOME AIR FORCE FACILITIES HAS BECOME CONTAMINATED WITH JET FUEL. THIS MATERIAL IS COMPRISED OF OVER 200 COMPONENTS, MOST OF WHICH ARE STRAIGHT AND BRANCHED-CHAIN HYDROCARBONS HAVING BETWEEN FIVE AND FIFTEEN CARBON ATOMS. SINCE ORGANISMS KNOWN TO DEGRADE SIMILAR COMPOUNDS ARE WIDESPREAD IN SOIL, IN SITU BIOREMEDIATION IS CONSIDERED A PROMISING APPROACH. THIS PROCESS CONSISTS OF ADDING OXYGEN AND NUTRIENTS TO THE GROUNDWATER TO STIMULATE HYDROCARBON-DEGRADING BACTERIA. CAMBRIDGE ANALYTICAL ASSOCIATES PROPOSES TO INVESTIGATE THE FEASIBILITY OF BIODEGRADATION OF JET FUEL BY CARRYING OUT TWO TYPES OF LABORATORY EXPERIMENTS USING MIXED CULTURE MICROCOSMS DEVELOPED FROM CONTAMINATED AQUIFER SAMPLES. ONE TYPE OF MICROCOSM WILL BE AN AQUEOUS SUSPENSION, IN A SEALED FLASK, WITH BACTERIA, JET FUEL, AND NUTRIENTS. DEGRADATION WILL BE MEASURED BY  $20(2)$  PRODUCTION AND THE COMPONENTS DEGRADED WILL BE DETERMINED USING GAS CHROMATOGRAPH. THE SECOND TYPE OF MICROCOSM WILL BE A FLOW-

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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THROUGH SOIL COLUMN TO SIMULATE THE PROCESSES THAT WOULD OCCUR DURING BIOREMEDIATION OF AN AQUIFIER. LOSS OF PERMEABILITY DUE TO BACTERIAL FOULING, AND DEGRADATION OF JET FUEL IN SOIL WILL BE STUDIED. THE BASIS WILL BE PROVIDED FOR PHASE II EXPERIMENTS TO OPTIMIZE NUTRIENT/OXYGEN DELIVERY SYSTEMS AND TO SCIENTIFICALLY DOCUMENT THE PROCESS IN THE FIELD.

CAPE COD RESEARCH PO BOX 600 - 95 MAIN ST BUZZARDS BAY, MA 02532 MYLES WALSH TITLE: HIGH POWER DENSITY PULSED ELECTROCHEMICAL ENERGY SOURCES T 5 OFFICE: DARPA	DARPA	\$ 80,240
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WHILE THE THEORETICAL BOUNDS ON THE ENERGY STORED BY AND THE POWER OUTPUT OF ELECTROCHEMICAL POWER SOURCES ARE WELL DEFINED BY THERMODYNAMIC AND PHYSICAL CONSIDERATIONS, THE DEGREE TO WHICH ONE CAN APPROACH THE THEORETICAL BOUNDS IS DETERMINED BY CONSTRAINTS IMPOSED BY THE DESIGN OF THE ELECTRODES AND PACKAGING MATERIALS. THIS RESEARCH DEALS WITH AN INNOVATIVE CONCEPT FOR MATERIALS AND PACKAGE DESIGN WHICH, IF SUCCESSFUL, WILL MAKE POSSIBLE A SUBSTANTIAL ADVANCE IN THE POWER DENSITY OF FIELDABLE ELECTROCHEMICAL POWER SOURCES. THE RESEARCH FOCUSES ON A SERIES OF EXPERIMENTS DESIGNED TO DEMONSTRATE THE FEASIBILITY OF ELIMINATING THE DUCTING AND MOST OF THE ELECTROLYTE NOW FOUND IN FUEL CELL DESIGNS. THE MATERIALS CHOSEN PERMIT OPERATION AT TEMPERATURES THAT PERMIT THE DIRECT ELECTROXIDATION OF METHANOL, AND AT TEMPERATURES WELL IN EXCESS OF THOSE NORMALLY ENCOUNTERED IN OPERATING BATTERIES.

CAPE COD RESEARCH PO BOX 600 - 95 MAIN ST BUZZARDS BAY, MA 02532 DR BRIAN DIXON TITLE: THERMAL INSULATING COATING T 152 OFFICE: NAVAIR/NADC	NAVY	\$ 66,778
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EXPOSIVES TYPICALLY BEGIN TO DETONATE WHEN HEATED TO TEMPERATURES ON THE ORDER OF 200 DEG C. THUS IT HAS BEEN RECOGNIZED THAT IT WOULD BE

FISCAL YEAR 1986

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VERY DESIRABLE TO INCREASE THE TIME AT WHICH WEAPONS REMAIN BELOW ABOUT 150 DEG C, EVEN IF THIS INCREASE IS ONLY A FEW MINUTES. COATINGS HAVE BEEN DEVELOPED WHICH MAINTAIN WEAPON TEMPERATURES BELOW 200 DEG C FOR ALMOST FIVE MINUTES EVEN WHEN THE WEAPON IS EXPOSED TO AVIATION FUEL FIRE. THE PROPOSED RESEARCH EXPLORES THE FEASIBILITY OF MAINTAINING THE SAME COATING THICKNESS BUT BY CHANGING THE PAINT FORMULATION TO EXTEND THE PROTECTION OF THE SUBSTRATE FROM 5 TO HOPEFULLY MORE THAN 8 MINUTES.

CAPE COD RESEARCH INC PO BOX 600 BUZZARDS BAY, MA 02532 DR BRIAN DIXON TITLE: MARINE ANTI-FOULING COATINGS T 52 OFFICE: NAVSEA	NAVY	\$ 69,895
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INCREASINGLY STRINGENT INDUSTRIAL SAFETY STANDARDS AND ENVIRONMENTAL REGULATIONS ARE RESTRICTING THE USE OF ORGANOMETALLIC BASED PAINT WITH THE RESULT THAT THE NAVY NOW HAS POORER QUALITY ANTIFOULING PAINT PERFORMANCE THAN IT HAD PRIOR TO RECENT DEVELOPMENTS. THIS PROPOSAL INVOLVES EXPLORING AN ENTIRELY NEW APPROACH TO ANTIFOULING PAINTS WHICH MAY PRODUCE ANTIFOULING SURFACES WITHOUT THE USE OF EXTREMELY TOXIC COMPOUNDS. THE PROPOSED APPROACH IS TO DEVELOP AN ANTIFOULING REDOX COATING CONSISTING OF MIXTURES OF CATALYSTS WHICH READILY CATALYZE THE REDUCTION OF DISSOLVED OXYGEN AND THE PARTIAL OXIDATION OF DISSOLVED ORGANIC MATTER. IT IS HOPED THAT THE HYDROGEN PEROXIDE PRODUCED BY OXYGEN REDUCTION WILL PROVIDE A SURFACE TOXIC TO MARINE ORGANISMS. THE PROPOSAL CONCENTRATES ON EXPERIMENTALLY STUDYING ONE KEY ISSUE: CAN ELECTROCHEMICALLY ACTIVE SURFACES BE CREATED THAT CONTINUOUSLY CATALYZE REDOX REACTIONS IN THE MARINE ENVIRONMENT.

CARBORIDE CORP 2020 LAKESIDE AVE CLEVELAND, OH 44114 L WILLIAM SAHLEY TITLE: HIGH TEMPERATURE DIESEL ENGINE PISTON CAP MATERIAL SYSTEMS T 114 OFFICE: TACOM/AMSTA	ARMY	\$ 50,000
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IT IS PROPOSED TO DEVELOP NEW OR IMPROVED ON KNOWN GRADIENT CERAMIC/

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METALLIC COATINGS FOR APPLICATION ON DIESEL IRON OR STEEL PISTONS CAPABLE OF WITHSTANDING 2000 DEF F COMBUSTION TEMPERATURES AND PROVIDING SIGNIFICANT THERMAL BARRIERS. THE TREND OF DIESEL ENGINE DEVELOPMENT AND PARTICULARLY THE LOW HEAT REJECTION (ADIABATIC) ENGINES TOWARDS HIGHER PISTON HEAD TEMPERATURES REQUIRES THE USE OF THERMAL BARRIERS TO CONTAIN THE HEAT IN THE COMBUSTION CHAMBER AND/OR TO PREVENT THE TRANSFER OR LOSS OF HEAT THROUGH THE PISTON.

CARLOW ASSOCS INC  
8315 LEE HWY  
FAIRFAX, VA 22031  
DR THOMAS B MALONE  
TITLE:

NAVY

\$ 49,910

MAN MACHINE INTERFACE DESIGN GUIDELINES FOR ARTIFICIAL INTELLIGENCE  
SIGNAL PROCESSING SYSTEMS

T 61 OFFICE: NAVSEA

THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP MAN/MACHINE INTERFACE DESIGN GUIDELINES FOR SIGNAL PROCESSING AND INFORMATION MANAGEMENT SYSTEMS THAT EMPLOY ARTIFICIAL INTELLIGENCE (AI) TECHNOLOGY. HOWEVER POWERFUL A COMPUTATIONAL TOOL AI MAY PROVE TO BE, THE ULTIMATE VALUE TO THE SYSTEM USER WILL STILL BE A FUNCTION OF THE QUALITY OF THE MAN/MACHINE INTERFACE. USERS WILL EXPECT THE OPERATION OF AN AI SYSTEM, AS REFLECTED IN THE MAN/MACHINE INTERFACE, TO BE LOGICAL AND STRAIGHTFORWARD (I.E., PARALLELING THEIR OWN COGNITIVE PROCESS). STANDARD, LOGICAL DISPLAY LAYOUTS AND DATA PRESENTATION FORMATS, EFFICIENT QUERY TECHNIQUES, AND BRIEF, BUT LUCID, EXPLANATIONS OF ANY CONCLUSIONS DRAWN BY THE COMPUTER ARE ALL NECESSARY ELEMENTS OF AN EFFECTIVE MAN/MACHINE INTERFACE FOR AN AI SYSTEM. THESE REQUIREMENTS WILL IMPOSE ADDITIONAL BURDENS ON DESIGNERS TO STRUCTURE THE VISIBLE ELEMENTS OF THE SYSTEM (I.E., THE MAN/MACHINE INTERFACE) TO BE COMPATIBLE WITH HUMAN CAPABILITIES AND EXPECTATIONS. THE PROPOSED EFFORT WILL EMPLOY A COMBINATION OF ANALYTICAL AND EMPIRICAL TECHNIQUES TO DEVELOP AND VALIDATE A COMPREHENSIVE SET OF GUIDELINES FOR DESIGNING MAN/MACHINE INTERFACES FOR AI SIGNAL PROCESSING AND INFORMATION MANAGEMENT SYSTEMS. THE FINAL PRODUCTION OF THIS PROJECT WILL BE A DESIGN SPECIFICATION FOR THE MAN/MACHINE INTERFACE OF A REPRESENTATIVE AI SIGNAL PROCESSING AND INFORMATION MANAGMENT SYSTEM.

CARLOW ASSOCS INC  
8315 LEE HWY  
FAIRFAX, VA 22031  
MARK KIRKPATRICK  
TITLE:

ARMY

\$ 56,565

ADVANCED HUMAN ENGINEERING TOOLS  
T 133 OFFICE: LABCOM/HEL

NUMEROUS TECHNIQUES AND METHODS HAVE BEEN DEVELOPED BY HUMAN FACTORS

FISCAL YEAR 1986

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(HF) RESEARCHERS FOR COLLECTING AND ANALYZING DATA TO PROVIDE SOLUTIONS TO MAN-MACHINE INTERFACE PROBLEMS. THE TOOLS MOST FREQUENTLY USED BY HF RESEARCHERS TODAY CAN NO LONGER BE EXPECTED TO KEEP PACE WITH THE RAPID ADVANCES IN MILITARY SYSTEMS. THE TECHNOLOGIES OF TODAY'S ADVANCED SYSTEMS REQUIRE THE HUMAN OPERATORS TO RELY MORE ON THEIR COGNITIVE SKILLS THAN ON PSYCHOMOTOR SKILLS, AS IN YEARS PAST. A METHOD IS PROPOSED HEREIN FOR IDENTIFYING ADVANCED TOOLS WITHIN THE CURRENT LITERATURE AND WITHIN THE FIELD OF BASIC AND APPLIED HUMAN RESEARCH. THE PHASES DURING SYSTEM DEVELOPMENT WHEN THE TOOLS ARE MOST LIKELY TO BE USED WILL BE IDENTIFIED. THE TOOLS WILL THEN BE TAXONOMIZED BY CATEGORY, FUNCTION, AND CLASS, WITH A DESCRIPTION OF THEIR ANALYTIC, DESIGN, EVALUATION, OR INTEGRATIVE FEATURES. MILITARY HF SPECIALISTS WILL BE ASKED TO IDENTIFY THE ADVANCED RESEARCH TOOLS WHICH THEY BELIEVE WILL BEST FACILITATE HF EVALUATIONS OF THE SOLDIER-MACHINE INTERFACE. FINALLY, A COST-EFFECTIVENESS MATRIX WILL BE DEVELOPED FOR DETERMINING IF THE GAINS IN PERFORMANCE JUSTIFY THE COSTS ASSOCIATED WITH PROCURING AND MASTERING A NEW TOOL.

CAS INC  
555 SPARKMAN DR - STE 1022  
HUNTSVILLE, AL 35816  
JOHN R ROBBINS  
TITLE:  
REAL-TIME RADOME ERROR COMPENSATION  
T 111 OFFICE: MICOM

ARMY

\$ 49,976

A NEW CONTROL TECHNOLOGY IS AVAILABLE WHICH CAN BE USED TO DESIGN AN ADAPTIVE, REAL-TIME COMPENSATOR TO COUNTER THE EFFECTS OF RADOME BORESIGHT ERRORS IN RF HOMING MISSILES. THIS CONTROL THEORY MAKES USE OF THE FACT THAT RADOME ERRORS ARE NOT COMPLETELY RANDOM, BUT MAY BE DESCRIBED BY THE WEIGHTED SUM OF A FINITE NUMBER OF FUNCTIONS WHOSE WEIGHTING COEFFICIENTS ARE ASSUMED PIECEWISE CONSTANT, BUT OTHERWISE COMPLETELY UNKNOWN. THIS FUNCTION IS THEN USED TO DESIGN A "DISTURBANCE OBSERVER" AND THE CONTROLLER NECESSARY TO COUNTER THE DISTURBANCE. THE PRIMARY OBJECTIVES OF THIS EFFORT WILL BE: 1. TO CHARACTERIZE TYPICAL RADOME BORESIGHT ERRORS FOR USE IN A DIGITAL MODEL. 2. TO DEVELOP A SIMPLIFIED MISSILE INTERCEPT SIMULATION INCLUDING RADOME BORESIGHT ERRORS. 3. TO DETERMINE AN APPROPRIATE SET OF FUNCTIONS TO DESCRIBE TYPICAL RADOME BORESIGHT ERRORS IN THE TIME DOMAIN. 4. TO DETERMINE THE MODIFICATIONS TO THE CONTROL THEORY

FISCAL YEAR 1986

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REQUIRED TO APPLY IT TO THE RADOME BORESIGHT ERROR PROBLEM.

CASTLE TECHNOLOGY CORP 52 DRAGON COURT WOBURN, MA 01801 DR J PAUL PEMSLER TITLE: CORROSION OF METAL MATRIX COMPOSITES IN HOSTILE ENVIRONMENTS T 113 OFFICE: NSWC	NAVY	\$ 49,304
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METAL MATRIX COMPOSITES ARE FABRICATED FROM HIGH STRENGTH FIBER OR PARTICLE REINFORCEMENTS AND A SUITABLE MATRIX ALLOY. ALUMINUM COMPOSITES HAVE SHOWN HIGH STRENGTH AND STABILITY AND ARE WELL SUITED TO ADVANCED MILITARY AND CIVIL DESIGN CONCEPTS. REINFORCING FIBERS OFTEN REACT WITH THE MATRIX ALLOY DURING FABRICATION AND PROCESSING FORMING A THIN DIFFUSION REACTION ZONE SURROUNDING THE REINFORCEMENT. THREE SEPARATE CORROSION REGIONS ARE THEN PRESENT IN THE COMPOSITE: FIBER, INTERDIFFUSION LAYER AND MATRIX ALLOY. TO STUDY THESE PHENOMENA, ALUMINUM METAL MATRIX COMPOSITES WILL BE HEAT TREATED TO ESTABLISH GROWTH OF THE INTERDIFFUSION LAYER FOR SEVERAL REINFORCING FIBERS INCLUDING GRAPHITE AND SILICON CARBIDE. THE CORROSION SUSCEPTIBILITY OF TREATED AND UNTREATED SAMPLES WILL BE COMPARED WITH THE MATRIX ALLOY. SHORT TERM EXPOSURE TESTS AND POTENTIODYNAMIC EVALUATIONS WILL BE CONDUCTED. THE EFFECT OF INTERDIFFUSION LAYER THICKNESS WILL ALSO BE CORRELATED WITH CORROSION SUSCEPTIBILITY OF THE COMPOSITE SAMPLE IN AQUEOUS CHLORIDE ENVIRONMENTS.

CASTLE TECHNOLOGY CORP 52 DRAGON CT WOBURN, MA 01801 DR J PAUL PEMSLER TITLE: COATINGS FOR CARBON-CARBON COMPOSITES FOR USE AT 3000 DEG - 4000 DEG F T 156 OFFICE: AFWAL/ML	AF	\$ 48,329
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ADVANCED AEROSPACE ENGINES AND STRUCTURAL COMPONENTS REQUIRE MATERIALS CAPABLE OF OPERATING IN OXIDIZING ENVIRONMENTS AT 3000 DEG - 40000 DEG F (1650 DEG - 2200 DEG C). TO ACHIEVE THIS OBJECTIVE WILL REQUIRE DEVELOPING ADVANCED COMPOSITE STRUCTURES AND PROTECTING

FISCAL YEAR 1986

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<p>THEM WITH NOVEL COATING SYSTEMS. THIS PHASE I PROPOSAL IS DIRECTED AT EVALUATING A NEW CLASS OF HAFNIUM OXIDE-BASED COATINGS THAT CAN SURVIVE FOR LONG PERIODS OF TIME AT THE UPPER TEMPERATURE LIMIT OF 2200 DEG C. METHODS OF PREPARATION AND EVALUATION OF THE COATING MATERIALS ARE DISCUSSED. STABILITY, WEIGHT LOSS, AND CHANGES IN BULK AND SURFACE COMPOSITION AFTER EXPOSURE AT 2200 DEG C IN AIR WILL BE MEASURED. COMPATABILITY WITH CARBON AND DIFFUSION BARRIERS AT HIGH TEMPERATURES WILL ALSO BE EVALUATED.</p>		

CASTLE TECHNOLOGY CORP. 52 DRAGON CT. WOBURN, MA 01801 J. PAUL PEMSLER, PHD TITLE: HIGH ENERGY/POWER DENSITY RAPID DISCHARGE BATTERIES - NEW APPROACH T 5 OFFICE:	SDIO	\$ 96,451
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NOVEL BATTERY CONFIGURATIONS WITH MICROELECTRODES ARE DESCRIBED. THESE BATTERIES SHOULD EXHIBIT VERY LOW INTERNAL CELL RESISTANCE, GREATLY REDUCED CONCENTRATION POLARIZATION EASE OF ACTIVATION IN THE RESERVE MODE AND EXTREMELY RAPID DISCHARGE. THEORETICAL CONSIDERATIONS PROVIDE THE BASIS FOR PRELIMINARY DESIGNS OF Li/SOCl(2) CELLS WITH MICROELECTRODES. AN EXPERIMENTAL PROGRAM IS DESCRIBED TO DEVELOP THE TECHNIQUES REQUIRED TO FABRICATE BENCH SCALE TEST CELLS, STUDY THEIR DISCHARGE CHARACTERISTICS IN THE MILLISECOND TIME FRAME AND MODEL THEIR BEHAVIOR. THE CONCEPT HAS WIDESPREAD GENERIC APPLICATIONS TO OTHER BATTERIES AND ELECTROCHEMICAL DEVICES.

CENTER FOR REMOTE SENSING 8200 GREENSBORO DR., SUITE 800 MCLEAN, VA 22102 SUMAN GANGULY TITLE: NUCLEAR EFFECTS SIMULATION T 2 OFFICE:	SDIO	\$ 48,679
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SOLAR X-RAY AND PARTICLE EVENTS CAN BE USED TO SIMULATE THE RESPONSE OF THE LOWER IONOSPHERE DUE TO X-RAY AND ENERGETIC PARTICLE BURSTS DURING A NUCLEAR EXPLOSION. AVAILABLE DATA ON X-RAY FLARE WILL BE ANALYZED AND ADDITIONAL DATA ON PARTICLE EVENTS WILL BE ACQUIRED.

FISCAL YEAR 1986

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DEPT

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AMOUNT

VALIDATION AND IMPROVEMENTS ON THE IONOSPHERIC CHEMISTRY CODES WILL BE MADE WITH THESE DATA AND FINALLY A RADIO PROPAGATION MODEL WILL BE DERIVED.

CENTER FOR REMOTE SENSING  
8200 GREENSBORO DR - STE 800  
MCLEAN, VA 22102  
SUMAN GANGULY

AF

\$ 48,414

TITLE:

PULSE PROPAGATION MODEL

T 71

OFFICE: AFSTC/XN

ADEQUATE MODELS OF THE IONOSPHERE AND THE ATMOSPHERE WILL BE ACQUIRED OR DEVELOPED AFTER A LITERATURE SURVEY. THE MODELS WOULD COVER THE MORPHOLOGY OF THE IONOSPHERE AND THE ATMOSPHERE COVERING TIME OF THE DAY, SEASON, GEOGRAPHICAL LOCATION, SOLAR CONDITIONS, GEOMAGNETIC SITUATION AND OTHER DISTRIBUTED CONDITIONS. RADIO WAVE PROPAGATION PARAMETERS THROUGH THESE MODELS WILL BE COMPUTED AND A RADIO PROPAGATION CODE THAT EVALUATES VARIOUS RADAR PARAMETERS AS THEY ENCOUNTER THESE PROPAGATION MEDIUM, WILL BE DEVELOPED. SUGGESTIONS WILL BE MADE FOR THE RADAR DESIGN, PARAMETERS, IN TERMS OF ANTENNAE, TRANSMITTER, FREQUENCY, ETC.

CERAMATEC, INC.  
163 WEST 1700 SOUTH  
SALT LAKE CITY, UT 84115  
NEILL WEBER

SDIO

\$ 50,000

TITLE:

SODIUM HEAT ENGINE DEVELOPMENT

T 5

OFFICE:

THE SODIUM HEAT ENGINE (SHE) IS AN EFFICIENT DEVICE FOR THE DIRECT CONVERSION OF THERMAL ENERGY TO ELECTRICAL ENERGY. THE DEVICE HAS HIGH SPECIFIC POWER BOTH ON A VOLUME AND WEIGHT BASIS, HIGH CONVERSION EFFICIENCY WHICH IS INDEPENDENT OF SIZE, AND NO MOVING PARTS WHICH IMPLIES POTENTIALLY HIGH RELIABILITY. THESE ATTRIBUTES MAKE THE SHE AN ATTRACTIVE DEVICE FOR SDI APPLICATIONS. ALTHOUGH THE PRINCIPLES OF OPERATION FOR THE SHE ARE LARGELY UNDERSTOOD AND DEMONSTRATION UNITS HAVE BEEN CONSTRUCTED AND OPERATED, MODIFICATIONS AND IMPROVEMENTS OF CURRENT DESIGNS ARE NECESSARY FOR DEPENDABLE



FISCAL YEAR 1986

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OPERATION IN A SPACE ENVIRONMENT. A PROGRAM IS PROPOSED TO CONSTRUCT AND EVALUATE A COST EFFECTIVE SODIUM RECIRCULATING CELL TO SERVE AS A TEST BED AND PROTOTYPE DEVICE FOR SPACE POWER APPLICATIONS.		

CHARLES RIVER ANALYTICS INC 55 WHEELER ST CAMBRIDGE, MA 02138 DR ALPHER K CAGLAYAN TITLE: A FAULT TOLERANT APPROACH TO HIGH-RELIABILITY SOFTWARE T 76 OFFICE: CECOM/AMSEL	ARMY	\$ 49,432
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AS MORE AND MORE WEAPON SYSTEMS EMPLOY CRUCIAL DIGITAL SYSTEMS IN THEIR ARCHITECTURES, COMPUTING SYSTEM RELIABILITY IS BECOMING AN EVER INCREASING PART OF THE OVERALL WEAPON SYSTEMS RELIABILITY. IN CONTRAST TO THE RELIABILITY LEVELS ATTAINED IN COMPUTER HARDWARE, SOFTWARE DEVELOPMENT IS NOT AS ADVANCED. IN FACT, MOST CURRENT SOFTWARE PRODUCTION METHODS DO NOT YIELD SOFTWARE PRODUCTS MEETING THE DESIRED RELIABILITY REQUIREMENTS. THE MAJOR AIM OF THIS STUDY IS TO INVESTIGATE THE APPLICATION OF SOFTWARE FAULT TOLERANCE TECHNIQUES TO BUILDING HIGH RELIABILITY SOFTWARE, AND TO DEVELOP A FAULT TOLERANT SOFTWARE RELIABILITY MODEL FOR THE EVALUATION OF FAULT TOLERANT SOFTWARE STRUCTURES IN WEAPON SYSTEMS.

CHASE CONSULTING INC 3543 CAMINITO CARMEL LANDING SAN DIEGO, CA 92130 LEONID B VOLFSO TITLE: INITIAL PROCESSING OF SPACE SHUTTLE CLOUD PHOTOGRAPHS T 74 OFFICE: AFGL/XOP	AF	\$ 46,205
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THE OBJECTIVE OF THIS PROPOSAL IS TO DIGITIZE AND RECTIFY CLOUD PHOTOGRAPHS TAKEN DURING SPACE SHUTTLE MISSIONS AND THEREFORE TO ALLOW FOR AUTOMATIC ANALYSIS. THE DIGITIZATION PROCEDURE WILL PRODUCE DIGITAL IMAGES THAT WILL BE RECORDED ON COMPACT CARTRIDGE TAPES OR FULL 9-TRACK TAPES ON THE MICROVAX II. THE SHUTTLE ORBITAL INFORMATION, TOGETHER WITH TIME AND VIEWING ANGLE INFORMATION FOR EACH INDIVIDUAL PHOTOGRAPH WILL BE USED TO COMPUTE THE ANGLE RELATIVE TO NADIR FROM WHICH EACH PHOTOGRAPH WAS TAKEN AND THE SCALE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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AT ALL PICTURE ELEMENTS OF EACH PHOTOGRAPH. IN ADDITION A GEO-  
GRAPHICAL GRID WILL BE PROVIDED FOR OVERLAYING ON EACH IMAGE WHEN  
DISPLAYED ON A SCREEN.

CHI SYSTEMS INC 1164 MCKELVEY LA BLUE BELL, PA 19422 DR WAYNE W ZACHARY TITLE: AN INTELLIGENT EMBEDDED TRAINER FOR NAVAL AIR ASW T 170 OFFICE: MTSC/NAVAIR	NAVY	\$ 51,706
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THIS PROJECT WILL DEVELOP THE ARCHITECTURE FOR A PROTOTYPE INTEL-  
LIGENT EMBEDDED TRAINER FOR A P-3C SENSOR STATION OPERATOR. THE EM-  
BEDDED TRAINER PROVIDES THE OPERATOR WITH SIMULATED ANTI-SUBMARINE  
WARFARE (ASW) PROBLEMS TO SOLVE, AND PROVIDES ADDITIONAL TRAINING AS  
NEEDED BY DIAGNOSING THE SOURCES OF ERRORS OR POOR PERFORMANCE IN THE  
SIMULATED PROBLEMS. THIS DIAGNOSIS IS DONE BY COMPARING THE OPERA-  
TOR'S RESPONSES AGAINST A SET OF SOLUTION TEMPLATES GENERATED FROM A  
KNOWLEDGE BASE OF RULES ELICITED FROM EXPERT SENSOR OPERATORS AND  
TRAINING PERSONNEL. WHEN THE OPERATOR'S RESPONSES DIFFER FROM THE  
EXPERT TEMPLATES, THE INTELLIGENT TRAINER DIAGNOSES THE AREAS OF  
KNOWLEDGE WHERE THE OPERATOR IS WEAK, AND GENERATES ADDITIONAL  
SIMULATION PROBLEMS THAT PROVIDE ADDED PRACTICE IN THE AREAS OF DE-  
FICIENCY.

CICCONE V J & ASSOCS INC 14045 JEFFERSON DAVIS HWY WOODBIDGE, VA 22191 RICHARD P SCHMITT TITLE: SEAWATER INTAKE FOR REVERSE OSMOSIS SWINPRO T 104 OFFICE: BRDC	ARMY	\$ 49,365
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THIS TECHNICAL PROPOSAL PRESENTS A LIGHT-WEIGHT MANUALLY INSTALLED  
RAW WATER INTAKE TO BE USED IN OPERATION WITH TRANSPORTABLE MILITARY  
WATER PURIFICATION UNITS WHEN SOURCE WATER IS OBTAINED FROM OCEAN  
SURFSIDE LOCATIONS. THE RAW WATER INTAKE SHALL MAKE USE OF SPECIAL  
NON-CLOGGING HIGH CAPACITY SUBMERSIBLE PUMPS THAT CAN HANDLE DEBRIS  
AND SAND WITHOUT DAMAGE. SAND EJECTORS, WATER JETS, VERTICAL PRES-

FISCAL YEAR 1986

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SURE AND ROTATION WILL BE USED TO DEVELOP A PROTECTED SHALLOW SEASIDE TYPE WELL. THE PROPOSED SBIR PHASE I RESEARCH WILL BE CARRIED ON IN TWO PARTS. PART I WILL INCLUDE HYDRAULIC STUDIES IN THE LABORATORY, PRELIMINARY SEAWATER PERMEATION MEASUREMENTS FROM SMALL DIAMETER CORES AT AN OCEAN SITE AND EXPLORATORY TESTING OF THE PRINCIPAL COMPONENTS OF THE "SWINFRO" AT AN OCEAN SITE. THE INFORMATION COLLECTED IN PART I WILL BE USED TO DEVELOP CONCEPTUAL DESIGN OF A SEAWATER INTAKE TO SUPPORT THE 600 GPH ROWPU. PART II OF PHASE I WILL INCLUDE PREPARATION OF EQUIPMENT DESIGN DRAWINGS, OF A PROTOTYPE "SWINFRO" MODEL FOR THE 600 GPH ROWPU.

CIM SYSTEMS INC 275 CAMPBELL RD - STE 411 RICHARDSON, TX 75080 RONALD B ELLIS TITLE: OPTIMUM CONCURRENT FLOW ROUTING IN A DYNAMIC NETWORK T 150 OFFICE: NWSC	NAVY	\$ 46,000
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THE EMERGENCE OF ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS TECHNOLOGY FROM THE LABORATORY ENVIRONMENT INTO GENERAL PRACTICE OFFERS A PROMISING APPROACH FOR THE DEVELOPMENT OF MANUFACTURING APPLICATIONS. MANUFACTURING SYSTEMS BUILT WITH THIS TECHNOLOGY WILL BE PARTICULARLY VALUABLE FOR SECOND AND THIRD TIER SUBCONTRACTORS IN THE DEFENSE INDUSTRY, BECAUSE THEY WILL ALLOW THE CAPTURE AND TRANSMISSION OF CRITICAL "KNOW HOW" TECHNOLOGY FROM THE PRIME CONTRACTORS AS WELL AS PROVIDING A MEANS FOR NEUTRALIZING THE EFFECT OF THE LOSS OF CRITICAL EXPERTS IN THE SMALLER ORGANIZATIONS. IN THIS PROPOSAL, CIM SYSTEMS, INC. PROPOSES TO COMBINE ITS EXTENSIVE EXPERIENCE IN THE MANUFACTURING DOMAINS WITH THE AI/ES EXPERTISE OF THE KNOWLEDGE BASED SYSTEMS LABORATORY AT TEXAS A&M UNIVERSITY. THE MANUFACTURING ORIENTATION OF THE KBS LAB AND THE PREVIOUS EXPERIENCE AT CIM SYSTEMS, INC. INSURES THE SUCCESS OF THIS PROPOSED COLABORATION TO INVESTIGATE THE CAPTURE OF THE KNOWLEDGE BASE OF EXPERIENCE PLANNERS, AND THE INCORPORATION OF THIS KNOWLEDGE INTO AN "INTELLIGENT PLANNING ASSISTANT".

CJ LASER CORP 3035 DRYDEN RD DAYTON, OH 45439 M CEM GOKAY TITLE: SOLID STATE COPPER LASER T 14 OFFICE: USMC/LBC	NAVY	\$ 74,983
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A RESEARCH AND DEVELOPMENT PROGRAM WILL BE CONDUCTED TO SHOW THE

FISCAL YEAR 1986

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TECHNICAL FEASIBILITY OF A SOLID STATE LASER CAPABLE OF PRODUCING LASER LIGHT NEAR THE OPERATING FREQUENCY OF THE COPPER METAL VAPOR LASER. ALONG WITH THIS TECHNICAL FEASIBILITY STUDY, COMPLETEY EXPERIMENTAL STUDY WILL BE CONDUCTED TO DETERMINE THE ANALYTICAL REQUIREMENTS OF THIS SOLID STATE COPPER LASER. THIS FEASIBILITY AND EXPERIMENTAL/ANALYTICAL STUDY WILL PERMIT SELECTION OF PROPER FINAL LASER SYSTEM DESIGN PARAMETERS PRIOR TO CONSTRUCT A MILITARY USE APPLICABLE LASER SYSTEM.

CKC INDUSTRIES INC PO BOX 151012 TAMPA, FL 33684 CHARLES CHENG TITLE: POWER CONVERTER 110 VAC TO 8 VDC T 37 OFFICE: SPAWAR	NAVY	\$ 11,054
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AN/PSC-2 DIGITAL COMMUNICATION TERMINAL (DCT) REQUIRES A POWER CONVERTER THAT CONVERTS 115 VAC TO 8 VDC FOR ABOARD SHIP USAGE. THE HIGH TEMPERATURE AND HUMIDITY CONDITION ON THE SHIP, COMBINING WITH THE POSSIBLE SALTY ATMOSPHERE CAN GREATLY LOWER THE RELIABILITY OF ANY ELECTRONIC DEVICE BECAUSE OF THEIR CORROSIVE ACTION ON THEM. THE PROPOSED CONVERTER IS BELIEVED TO SURVIVE THE HARSH ATMOSPHERE CONDITION AND DELIVER THE REQUIRED POWER.

CLARK S ASSOCS INC 548 S SPRING ST - STE 534 LOS ANGELES, CA 90014 DR HENRY P SHENG TITLE: FUEL STORAGE TANK WATER BOTTOM DETECTION SYSTEM T 77 OFFICE: NAVSUP	NAVY	\$ 49,443
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THE SCOPE OF THIS RESEARCH AND DEVELOPMENT EFFORT IS TO DETERMINE WHETHER A SUITABLE REMOTE WATER DETECTION SYSTEM IS AVAILABLE. THE PROJECT WILL BE DIVIDED INTO TWO PHASES. DURING PHASE I, A THOROUGH AND EXTENSIVE REVIEW OF THE LITERATURE WILL BE CONDUCTED TO DETERMINE WHETHER FEASIBLE SYSTEMS TO DETECT WATER AT THE BOTTOM OF FUEL TANKS EXIST OR CAN BE DEVELOPED. INCLUDED IN PHASE I WILL BE A TECHNICAL AND STATISTICAL EVALUATION OF THE RELIABILITY, ACCURACY AND MAIN-

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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TAINABILITY OF EXISTING EQUIPMENT(S), AND RECOMMENDATIONS OF SELECTED SYSTEMS FOR FUTURE TESTING. IN PHASE II, THE RECOMMENDED MONITORING SYSTEMS WILL BE DEVELOPED/MODIFIED AND FIELD TESTED TO DETERMINE THEIR ACCURACY, RELIABILITY, MAINTAINABILITY AND ECONOMIC PAYBACK TO THE U.S. NAVY.

CLARKEWORKS 5814 SW 81ST ST MIAMI, FL 33143 DR THOMAS L CLARKE TITLE: MULTI-WAVELENGTH AUTOMATIC REFRACTION CORRECTION T 73 OFFICE: LABCOM/ASL	ARMY	\$ 47,630
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A METHOD FOR AUTOMATIC MEASUREMENT OF ATMOSPHERIC REFRACTION BETWEEN TARGET AND RECEIVER BASED UPON MEASUREMENT OF THE DISPERSION IN THE TARGET IMAGE RESULTING FROM THE ATMOSPHERIC REFRACTION IS PROPOSED. THE DISPERSION WILL BE MEASURED USING A COMBINATION OF WAVELENGTH SELECTIVE OPTICS, ARRAYS OF SOLID-STATE SENSORS, AND A PC-CLASS COMPUTER. THE AUTOMATIC REFRACTION CORRECTOR (ARC) WILL BE TESTED ON ASTRONOMICAL OBJECTS (E.G. THE MOON) WITH KNOWN REFRACTION VERSUS ALTITUDE RELATION. SEVERAL CONFIGURATIONS FOR THE WAVELENGTH SELECTIVE OPTICS WILL BE TESTED. UTILITY OF DIFFERENT ALGORITHMS TO REMOVE TURBULENT DISTORTIONS WILL BE INVESTIGATED AND TESTED FOR PROPAGATION UNDER TERRESTRIAL CONDITIONS.

CLEVELAND CRYSTALS INC 19306 REDWOOD AVE CLEVELAND, OH 44110 JACK HIETANEN TITLE: GROWTH OF LASER QUALITY AgGaSe <sub>2</sub> T 107 OFFICE: AFWAL/AA	AF	\$ 49,266
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THE FEASIBILITY OF GROWING AND HEAT TREATING CRYSTALS OF AgGaSe<sub>2</sub> TO YIELD OPTICAL ELEMENTS OF SUFFICIENT SIZE AND QUALITY AND SUITABLE FOR HIGH POWER NONLINEAR APPLICATIONS IS EXAMINED. THE HISTORY OF THE DEVELOPMENT OF THIS MATERIAL IS REVIEWED WHICH POINTS OUT THE MANY PROBLEMS ENCOUNTERED IN CRYSTAL GROWTH AND IN ELIMINATING UNSIRABLE SCATTERING CENTERS IN THE GROWN CRYSTALS. BY ANALYZING THE

FISCAL YEAR 1986

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COLLECTIVE EXPERIENCE GAINED FROM EARLIER STUDIES AND THE EXPERIENCE GAINED FROM CLOSELY RELATED MATERIALS SUCH AS AgGaS(2') A DETAILED PLAN OF ATTACK IS DEVELOPED. THE PROGRAM OBJECTIVES ARE: (1) TO PRODUCE AT LEAST ONE GOOD QUALITY 35MM DIAMETER BY 60MM LONG AgGaSe(2) CRYSTAL BY A SEEDDED BRIDGMAN METHOD, (2) TO DETERMINE PROCEDURES AND CONDITIONS TO ALLOW RECOVERY OF CRACK-FREE CRYSTALS ON A CONSISTENT BASIS, (3) TO DETERMINE HEAT TREATING CONDITIONS THAT YIELD CRYSTALS WITH ABSORPTION COEFFICIENTS LESS THAN  $0.05\text{cm}^{-1}$ , AND (4) TO EXAMINE SURFACE TREATMENTS TO INCREASE THE DAMAGE THRESHOLD TO GREATER THAN  $50\text{MW}/\text{cm}^2$  FOR Q-SWITCHED LASER PULSES. THE PEOPLE, FACILITIES, EXPERIENCE, CONTACTS, AND DESIRE AT CLEVELAND CRYSTALS ARE WELL SUITED TO MEET THESE PROGRAM OBJECTIVES.

CLEVELAND CRYSTALS INC  
19306 REDWOOD AVE  
CLEVELAND, OH 44110  
DAVID A ROBERTS

AF

\$ 49,247

TITLE:

A 100mw TUNABLE UREA OPTICAL PARAMETRIC OSCILLATOR WITH OUTPUT IN THE VISIBLE TO NEAR-INFRARED

T 110

OFFICE: AFWAL/AA

THE OPTICAL PARAMETRIC OSCILLATOR (OPO) IS KNOWN TO BE A WIDELY TUNABLE SOURCE OF LASER RADIATION. WIDESPREAD USE OF OPO'S HAS NOT OCCURRED BECAUSE SUITABLE NON-LINEAR MATERIALS HAVE NOT BEEN AVAILABLE. RECENT RESEARCH AT CORNELL UNIVERSITY HAS SHOWN UREA IS A POTENTIALLY EXCELLENT MATERIAL FOR USE IN OPO'S WITH OUTPUTS IN THE VISIBLE TO NEAR-INFRARED SPECTRAL REGION. OVERALL CONVERSION EFFICIENCY AS HIGH AS 23% HAS BEEN DEMONSTRATED WITH A SINGLY RESONANT UREA OPO PUMPED BY A TRIPLED Q-SWITCHED Nd-YAG LASER. AVERAGE OUTPUT POWER AT 10Hz HAS BEEN LIMITED TO 6mw. THE OBJECTIVE OF THIS PROGRAM IS TO DESIGN, ASSEMBLE AND TEST A UREA OPO OPTIMIZED FOR GENERATION 100mw AVERAGE POWER CONTINUOUSLY TUNABLE FROM 550nm-1000nm WHEN PUMPED WITH THE TRIPLED OUTPUT OF A Q-SWITCHED Nd-YAG LASER OPERATING AT 10Hz. THE OPO WILL BE A FLUID FILLED HOUSING WITH DICHROIC DIELECTRIC MIRRORS AS HOUSING WINDOWS AND THE LARGEST AVAILABLE UREA CRYSTAL MOUNTED INSIDE. ROTATION OF THE UREA CRYSTAL INSIDE THE HOUSING WILL TUNE THE OUTPUT. THE UREA OPO WILL BE TESTED FOR OSCILLATION THRESHOLD, OUTPUT AT VARIOUS INPUT POWERS AND OUTPUT WAVELENGTHS, MAXIMUM OUTPUT POWER, AND THE SPECTRAL, SPACIAL AND TEMPORAL QUALITY OF THE OUTPUT.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
COAL GAS INC 115 M UMSTEAD INDUSTRIAL PK RALEIGH, NC 27612 DR A J ATTAR TITLE: LOW-COST INDICATOR AND DOSIMETER FOR WARFARE GASES T 89 OFFICE: ASD/AE	AF	\$ 68,897

THE OBJECTIVE OF THIS PROPOSAL IS TO CONDUCT PRELIMINARY TESTS ON A NOVEL CHEMISTRY WHICH COULD RESULT IN THE PRODUCTION OF A LOW COST WAFER WHICH CHANGES COLOR UPON EXPOSURE TO WARFARE GASES (WG). SIMILAR WAFERS WHICH WE DEVELOPED FOR OTHER GASES ARE ABOUT 2" x 1" x 1/16" AND WEIGH ABOUT 2.3 gm. THESE CHROMOSENSE (tm) WAFERS CAN DETECT HYDROGEN SULFIDE, ETC. IN 10-30 SEC. AT CONCENTRATIONS OF THE ORDER OF 10-50 ppb; THE RANGE OF PERFORMANCE PARAMETER IS SIMILAR TO THAT NEEDED FOR WG. IN PHASE I COAL GAS, INC. WILL INVESTIGATE TWO POSSIBLE CHEMISTRIES FOR THE DETECTION AND DETERMINATION OF WG, WILL OPTIMIZE THE DRY-CHEMISTRY OF THE FORMULATION USING SIMULANTS FOR THE ACTUAL GASES, WILL DERIVE SELECTIVITY DATA USING INTERFERENCES SUCH AS METHANOL, PENTACHLOROETHYLENE, FREONS AND AMMONIA. IN ADDITION, THE EFFECT OF THE TEMPERATURE, GAS CONCENTRATION, EXPOSURE TIME AND RELATIVELY HUMIDITY WILL BE ESTABLISHED AS WELL AS THE SHELF LIFE, USING ACCELERATED AGING. SHOULD THE RESULTS BE SATISFACTORY, TESTS WILL BE SCHEDULED WITH THE REAL GASES TOGETHER WITH A DOD LABORATORY. COAL GAS, INC. HAS PROVEN THAT THE PRINCIPLES OF THE PROPOSED CHEMISTRY WORK WITH ORGANIC PHOSPHATES AND ORGANIC CHLORIDES WITH AN ACTIVATED CHLORINE; HOWEVER, NO DATA WERE DERIVED ON CONVENTIONAL SIMULANTS FOR NERVE GASES.

COHERENT TECHNOLOGIES INC PO BOX 7488 BOULDER, CO 80306 R MILTON HUPFAKER TITLE: SPACEBORNE COHERENT DIAL SYSTEM FOR WIND AND WATER VAPOR MEASUREMENT FEASIBILITY T 60 OFFICE: AFSTC/OLAB	AF	\$ 47,270
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THE CAPABILITY OF PERFORMING BOTH ATMOSPHERIC WIND VELOCITY AND

FISCAL YEAR 1986

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WATER VAPOR CONCENTRATION MEASUREMENT WITH A PULSED COHERENT LASER RADAR IS IMPORTANT IN MANY METEOROLOGICAL, ENVIRONMENTAL AND WEATHER FORECASTING APPLICATIONS. COHERENT LIDAR SYSTEMS ARE PROVEN INSTRUMENTS FOR THE REMOTE MEASUREMENT AT ATMOSPHERIC WIND PROFILES. A RANGE RESOLVED COHERENT DIAL SYSTEM HAS NOT BEEN DEVELOPED AT THIS TIME. PULSED COHERENT DIAL SYSTEMS OFFER MUCH GREATER SENSITIVITY AND RANGE THAN INCOHERENT DIAL SYSTEMS ESPECIALLY IN THE INFRARED WAVELENGTH REGIONS. THE EVENTUAL GOAL IS TO DETERMINE THE FEASIBILITY OF COMBINED WIND AND WATER VAPOR PROFILES FROM A SPACE PLATFORM. THIS PROPOSAL ADDRESSES THE FEASIBILITY AND DESIGN PARAMETERS FOR A GROUND- AND A SATELLITE-BASED COHERENT DIAL AND WIND PROFILING SYSTEM. TO PREDICT THE PERFORMANCE OF A COHERENT DIAL SYSTEM, AN EXISTING COHERENT LIDAR COMPUTER SIMULATION FOR WIND MEASUREMENT WILL BE MODIFIED TO INCLUDE THE DIAL MEASUREMENT PROCESS. THIS COMPUTER SIMULATION WILL CONTAIN THE WIND MEASURING PROCESS, DIAL LIDAR CHARACTERISTICS, ATMOSPHERIC EFFECTS, SPECTROSCOPIC DATA, AND DATA PROCESSING TECHNIQUES, AND WILL BE EXERCISED EXTENSIVELY TO DETERMINE THE FEASIBILITY AND DESIGN PARAMETERS FOR A COHERENT COMBINED WIND AND DIAL SYSTEM FOR BOTH A GROUND-BASED AND OPERATIONAL SATELLITE PLATFORM.

COLEMAN RESEARCH CORP  
4946 RESEARCH DR  
HUNTSVILLE, AL 35805  
GEOFFREY L HEARNE  
TITLE:

AF

\$ 49,853

SIMPLIFIED STRUCTURAL AND DYNAMIC ANALYSIS CODES FOR MISSILE AND DEPLOYED OBJECT DESIGN ANALYSIS

T 251 OFFICE: BMO/MYSC

THE RESEARCH AND DEVELOPMENT EFFORT PROPOSED HEREIN WILL PROVIDE THE FOUNDATION AND METHODOLOGY FOR BUILDING A SIMPLIFIED STRUCTURAL AND DYNAMIC ANALYSIS CODE FOR MISSILE AND DEPLOYED OBJECT DESIGN ANALYSIS. THE CODE WILL GENERATE ALL CRITICAL DESIGN LOADING CONDITIONS USING AERODYNAMIC, PROPULSION, AND INERTIAL DATA AS INPUT. THE CODE WILL THEN APPLY THESE LOADS TO A SIMPLIFIED FINITE ELEMENT MODEL OF THE VEHICLE STRUCTURE, AND PERFORM A STATIC STRENGTH AND DYNAMIC RESPONSE ANALYSIS OF THE STRUCTURAL CONFIGURATION.

COLEMAN RESEARCH CORP.  
2462 SAND LAKE RD.  
ORLANDO, FL 32809  
JOEL GREENSTEIN

SDIO

\$ 49,941

TITLE:

CONTROL OF A SPACE-BASED ELECTROMAGNETICALLY LAUNCHED PROJECTILE VIA A MODIFIED NUTATION DAMPER

T 2 OFFICE:

A DEVICE IS HEREIN PROPOSED WHICH CAN BE INCORPORATED INTO A PRO-



FISCAL YEAR 1986

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JECTILE, SUCH AS A RAIL GUN PROJECTILE, TO CONTROL ATTITUDE. THE DEVICE, A MODIFIED NUTATION DAMPER, HAS ESSENTIALLY ONLY ONE MOVING PART AND SO CAN BE MADE, TO EXHIBIT EXTREME STRENGTH. BY CONTROLLING THE PROJECTILE'S ATTITUDE DURING FLIGHT, A STRAP DOWN SEEKER CAN BE MADE TO MECHANICALLY SCAN FOR TARGET ACQUISITION. THE ATTITUDE CONTROL FEATURE CAN THEN BE USED TO LOCK THE SEEKER ON THE TARGET DURING THE REMAINDER OF THE FLIGHT. A STRAWMAN HARDENED PROJECTILE WILL BE SYNTHESIZED. THE MODIFIED NUTATION DAMPER WILL BE DESIGNED AND STUDIED. EQUATIONS OF MOTION WILL BE DERIVED AND VERIFIED FOR A PROOF OF PRINCIPAL EFFORT. DESIGN DETAILS SUCH AS THE MASS FRACTION REPRESENTED BY THE DEVICE AND A SUITABLE MATERIAL FOR THE ECCENTRIC MASS WILL BE PROPOSED. FOLLOW-ON WORK WOULD INCLUDE THE INCORPORATION OF THESE RESULTS IN A SIX DEGREE-OF-FREEDOM (6-DOF) FLIGHT/ENGAGEMENT SIMULATION MODEL. A CONTROL LAW WILL BE DEVELOPED. EFFECTIVITY STUDIES WILL BE CARRIED OUT.

COLORADO CHEMICAL SPECIALTIES INC	AF	\$ 47,142
4295 MCINTYRE ST		
GOLDEN, CO 80403		
RONALD E DRAKE		
TITLE:		
SBS BLOCK COPOLYMER THERMOPLASTIC ELASTOMERS FOR SOLID PROPELLANT APPLICATIONS		
T 79	OFFICE: AFRPL/TSTR	

SBS BLOCK COPOLYMERS CAN BE SPECIFICALLY DESIGNED FOR SOLID PROPELLANT BINDER APPLICATIONS. BY MANIPULATION OF THE RELATIVE CHAIN LENGTH AND THE STRUCTURE OF THESE CHAINS, THERMOPLASTIC ELASTOMERS CAN BE MADE WHICH HAVE SPECIFIC CHARACTERISTICS. THE PURPOSE OF THIS STUDY IS TO DETERMINE THE PARAMETERS MOST NEEDED FOR SOLID PROPELLANT BINDER APPLICATIONS AND TO MAKE AND TEST SBS BLOCK COPOLYMERS WHICH MEET THESE REQUIREMENTS. PHASE I WORK WILL BE DIRECTED TOWARD DEFINITION OF SPECIFIC PROPERTIES REQUIRED FOR A THERMOPLASTIC SOLID PROPELLANT BINDER AND THE SYNTHESIS AND CHARACTERIZATION OF SUCH MATERIALS. PHASE II WORK WILL INVOLVE PROCESSING, CASTING AND HANDLING CHARACTERISTICS OF SUCH BINDERS. IT IS EXPECTED THAT INFORMATION ON PRACTICAL PROCESSING PARAMETERS WILL RESULT IN CERTAIN STRUCTURAL MODIFICATIONS WHICH MAY LEAD TO CHANGES AND IMPROVEMENTS IN THE BINDER. ACTUAL MANUFACTURE AND TESTING OF PROPELLANTS WILL NOT BE DONE, EXCEPT FOR VERY SMALL QUANTITIES SUFFICIENT TO TEST COMPATIBILITY WITH OXIDANTS AND OTHER ADDITIVES, AND TO ROUGHLY EXPLORE THE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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## ENERGETICS OF THE SYSTEM.

COMDEL INC BEVERLY AIRPOR - L P HENDERSON RD BEVERLY, MA 01915 THEODORE E JOHNSON TITLE: AN OPTIMUM RADIO COMMUNICATION SYSTEM FOR ROBOTIC VEHICLES - STUDY PROGRAM T 113 OFFICE: TACOM/AMSTA	ARMY	\$ 82,560
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COMDEL WILL PERFORM RESEARCH TO PROVIDE AN OPTIMUM SYSTEM DESIGN FOR A RADIO COMMUNICATIONS LINK BETWEEN A ROBOTIC VEHICLE AND ITS CONTROL POINT. RESEARCH WILL INCLUDE THE SELECTION OF AN APPROPRIATE FREQUENCY BAND, MODULATION SCHEME, ANTENNA TYPE AND ANTENNA POINTING TECHNIQUE. THE APPLICABILITY OF REPEATERS WILL BE ANALYZED. FIELD MEASUREMENTS WILL BE MADE TO GATHER SUBJECTIVE INFORMATION ON PROPAGATION AND MULTIPATH EFFECTS IN A TACTICAL ENVIRONMENT.

COMMAND SYSTEMS GROUP, INC. 23430 HAWTHORNE BLVD., SUITE 150 TORRANCE, CA 90505 MARVIN I. MARTIN TITLE: RESEARCH IN AI FOR ON-BOARD MISSION/PAYLOAD MANAGEMENT IN MULTI-PAYLOAD UNMANNED AIR VEHICLES T 61 OFFICE: CECOM/AMSEL	ARMY	\$ 50,712
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THE FEASIBILITY OF AN ARTIFICIAL INTELLIGENCE SYSTEM FOR UNMANNED AIR VEHICLE (UAV) MISSION PLANNING, NAVIGATION WAYPOINT SELECTION AND INTEGRATED ESM/EO PAYLOAD OPERATIONS WILL BE DEMONSTRATED VIA RAPID PROTOTYPING. THE MISSION PLANNING ALGORITHM WILL RECOGNIZE CONFLICTS AMONG MILITARY/OPERATIONAL REQUIREMENTS WHICH ARE COMPETING FOR AVAILABLE UAV RESOURCES; A SYSTEM OF RULES WILL BE APPLIED TO RECONCILE CONFLICTS. THE NAVIGATION WAYPOINT SELECTION ALGORITHM WILL SELECT THE MOST EFFICIENT FLIGHT PATH FOR IMPLEMENTING THE MISSION PLAN SUBJECT TO RULES FOR MINIMIZING VULNERABILITY OF ENEMY AIR DEFENSE. THE ESM/EO PAYLOAD OPERATIONS MODULE WILL: 1) CORRELATE EMITTER LINES OF BEARINGS ACQUIRED BY THE ESM PAYLOAD AGAINST REDEPLOYABLE TARGETS AT DIFFERENT TIMES, 2) CORSS-CORRELATE DIFFERENT

FISCAL YEAR 1986

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EMITTERS WHICH ARE ASSOCIATED WITH C3 NODES AND COMBAT UNITS TO FORM A MATRIX OF RADIO NETWORKS AND NODE RELATIONSHIPS, 3) APPLY A "MINIMUM ENTROPY" ALGORITHM TO DETERMINE THE MINIMUM SET OF NODES WHICH SHOULD BE IMAGED BY THE EO PAYLOAD IN ORDER TO RESOLVE AMBIGUITIES IN THE NETWORK/NODE MATRIX, AND 4) APPLY AI PATTERN RECOGNITION TECHNIQUES TO FUNCTIONALLY IDENTIFY NETWORKS AND NODES. RAPID PROTOTYPING WILL EMPLOY NETTED COMPAQ COMPUTERS AND HIGH-LEVEL LANGUAGE TO DEMONSTRATE FEASIBILITY OF ALGORITHMS.

COMMUNICATIONS &amp; SYSTEMS SPECIALISTS INC

NAVY

\$ 26,759

3901 NATIONAL DR - STE 280

BURTONSVILLE, MD 20866

GEORGE MAHLER

TITLE:

THLL BASED SYMBOLIC DEBUG FACILITY FOR VAX/VMS

T 104

OFFICE: NSWC

THLL IS THE TRIDENT HIGHER LEVEL LANGUAGE WHICH IS USED FOR TRIDENT FIRE CONTROL PROGRAM DEVELOPMENT AND FOR SYSTEMS PROGRAMMING ON THE VAX. THIS SBIR OBJECTIVE IS TO DEVELOP THE FEASIBILITY OF INTER-FACING THE THLL COMPILER TO THE VAX SYMBOLIC DEBUGGER.

COMPACT DISCOVERIES INC

AF

\$ 32,200

1050 S FEDERAL HWY

DELRAY BEACH, FL 33444

MARY ANN O'CONNOR

TITLE:

DEFINITION OF A LONG-RANGE PLANNING MANAGEMENT INFORMATION SYSTEM

T 258

OFFICE: BMO/MYSC

THIS PROJECT INVOLVES A DETAILED STUDY OF THE INFORMATION REQUIREMENTS AND SOURCES OF INFORMATION FOR AIR FORCE PLANNERS. THE DATA COLLECTED WILL BE USED AS INPUT INTO THE DESIGN OF AN INFORMATION SYSTEM TO COLLECT, UPDATE, AND ACCESS LARGE QUANTITIES OF EXISTING INFORMATION ON PROGRAM COST, SCHEDULE AND EFFECTIVENESS, TO BE UTILIZES IN THE LONG-RANGE PLANNING PROCESS. THE STUDY WILL BE CONDUCTED WITH THE OBJECTIVE OF ULTIMATELY DEVELOPING A PROTOTYPE DATA MANAGEMENT SYSTEM THAT IS OPTIMIZED TO THE NEEDS OF THE USERS AND INCORPORATES MINIMAL DATA COLLECTION TIME. THE STUDY WILL INCLUDE INTERVIEWS AND "HANDS-ON" WORK-STUDY TECHNIQUES TO INSURE ACCURATE

FISCAL YEAR 1986

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REPORTING OF USER REQUIREMENTS. IN ADDITION, RECOMMENDATIONS AND SPECIFICATIONS CONCERNING SYSTEM DESIGN WILL BE MADE WITH A THOROUGH UNDERSTANDING OF THE TECHNOLOGICAL OPTIONS AVAILABLE AND THE CORRESPONDING BENEFITS ASSOCIATED WITH EACH. THESE TECHNOLOGICAL OPTIONS WILL INCLUDE, BUT ARE NOT LIMITED TO, MICROCOMPUTERS, NETWORKS, DOCUMENT SCANNERS AND OPTICAL (LASER) STORAGE.

COMPUSEC INC 5333 MISSION CENTER RD - STE 100 SAN DIEGO, CA 92108 MARGARET MURRAY TITLE: SECURE SOFTWARE SOURCE CODE VERIFICATION TOOLS T 46 OFFICE: ESD/XRCT	AF	\$ 36,274
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THE NATURE OF THE BUILT-IN FLEXIBILITY OF A COMPUTER SYSTEM MAKES IT EXTREMELY VULNERABLE TO BOTH THE NEGLIGENCE OF AUTHORIZED USERS AND INTENTIONAL, SURREPTITIOUS ATTACKS BY ADVERSARIES. SECURE SOFTWARE IS THE USER'S GOAL. SECURE SOFTWARE IS SOFTWARE WHICH ADHERES TO THE CRITERIA DICTATED BY THE ORANGE BOOK (CSC-STD-001-83). IT CAN BE TRUSTED TO CORRESPOND EXACTLY TO ITS DESIGN SPECIFICATIONS. ALSO, IT OUGHT NOT DEVIATE FROM THAT DESIGN AFTER ENTERING THE IMPLEMENTATION PHASE. SECURE SOFTWARE DESIGN IS CURRENTLY FEASIBLE THROUGH STATE-OF-THE-ART DESIGN VERIFICATION. HOWEVER, CODE VERIFICATION IS LARGELY A MANUAL ART, HIGHLY DEPENDENT ON THE SKILL AND EXPERTISE OF THE RESEARCHER. COMPUSEC PROPOSES A REVOLUTIONARY AUTOMATED CONCEPT WHEREIN IMPLEMENTED CODE CAN BE DIRECTLY VERIFIED FOR ADHERANCE TO SPECIFICATION. THUS THE GAP BETWEEN DESIGN AND IMPLEMENTATION IS CLOSED. BACKDOORS, TRAPDOORS AND TIMEBOMBS (IF INSERTED IN THE TIMEFRAME BETWEEN DESIGN AND IMPLEMENTATION) WILL HENCEFORTH BE DETECTABLE BY VERIFICATION OF THE ACTUALLY IMPLEMENTED CODE.

COMPUTATIONAL MECHANICS CO INC 4804 AVE H AUSTIN, TX 78751 DR JON M BASS TITLE: ADAPTIVE GRID TECHNIQUES FOR USE IN COMPUTATIONAL FLUID DYNAMICS T 86 OFFICE: AFWL/PRC	AF	\$ 47,384
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THIS PROJECT FOCUSES ON THE TWO MOST IMPORTANT ISSUES OF ALL OF

FISCAL YEAR 1986

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COMPUTATIONAL FLUID DYNAMICS: 1) HOW GOOD ARE THE NUMERICAL ANSWERS OBTAINED IN A COMPUTATION? AND 2) HOW CAN THE BEST POSSIBLE ANSWERS BE OBTAINED FOR A FIXED AND LIMITED COMPUTATIONAL EFFORT, BUDGET, OR COMPUTING CAPABILITY? IN GENERAL TERMS THE ANSWERS TO THESE QUESTIONS ARE 1) TO DETERMINE RELIABLE A-POSTERIORI ESTIMATES OF ERROR BASED ON FLOW RESIDUALS AND 2) TO DEVELOP SELF-ADAPTIVE SCHEMES TO REDUCE LOW ERRORS. THE PROJECT EXPLORES THESE DIFFICULT QUESTIONS AND CONCENTRATES ON THE DEVELOPMENT OF UNIQUE ALGORITHMS FOR RESOLVING THEM. ATTENTION IS GIVEN TO COMPLEX FLOW PHENOMENA IN REACTING FLUIDS AND EMPHASIS ON MODELS OF LASER FLOW FIELDS.

COMPUTER * THOUGHT CORP 1721 W PLANO PKWY - STE 125 PLANO, TX 75075 DR MARK L MILLER TITLE: PROTOTYPE INTELLIGENT MAINTENANCE TUTORING SYSTEM T 221 OFFICE: ARI/PERI	ARMY	\$ 0
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THE UTILIZATION OF INTELLIGENT MAINTENANCE TUTORING SYSTEMS ACROSS A WIDE RANGE OF APPLICATIONS CAN BRING A NEW LEVEL OF ABILITY AND LEARNING. TO DEMONSTRATE THE POTENTIAL INHERENT IN THIS CONCEPT, COMPUTER \* THOUGHT WILL BUILD AND DELIVER A SOFTWARE SYSTEM THAT IS A WORKING PROTOTYPE FOR A MAINTENANCE TRAINING SYSTEM FOR ASSISTING PERSONNEL IN FAULT DIAGNOSIS AND REPAIR OF DEFECTIVE M16 INFANTRY RIFLES. THE METHODOLOGY UTILIZED IN THIS PROTOTYPE WILL BE APPLICABLE TO OTHER SYSTEMS. THE TRAINING SYSTEM WILL INCLUDE AN EXPERT SYSTEM TO HELP THE USER IN FAULT DIAGNOSIS AND A COMPUTER-BASED TRAINING MODULE TO TEACH THE USER THE NECESSARY SKILLS TO EFFECT THE REPAIR. THE SYSTEM WILL EXECUTE ON AN IBM PERSONAL COMPUTER, XT OR AT OR A COMPATIBLE MACHINE. THE PROTOTYPE WILL DEMONSTRATE THAT AN INTELLIGENT TUTORING SYSTEM CAN BE PRODUCED AND FIELDIED ON A PERSONAL COMPUTER SYSTEM. IT WILL SHOW THAT COMBINING AN EXPERT SYSTEM WITH TRADITIONAL COMPUTER-BASED TRAINING RESULTS IN A SYSTEM THAT: (a) ADAPTS TO THE USER'S LEVEL OF EXPERTISE AND (b) PROVIDES INSIGHT THROUGH THE DOMAIN EXPERTISE. THE FINAL REPORT WILL DISCUSS HOW TO EXTEND THIS EXAMPLE FOR A BROAD ARRAY OF USES.

COMPUTER SCIENCE INNOVATIONS INC 1280 CLEARMONT ST NE PALM BAY, FL 32905 ROBERT J WHITE TITLE: ADAPTIVE NULLING BY ELECTRICAL SURFACE CONTROL OF A REFLECTOR ANTENNA T 53 OFFICE: RADC/DOR	AF	\$ 49,885
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AN INNOVATIVE APPROACH TO FORMING A NULL IN THE SECONDARY PATTERN

FISCAL YEAR 1986

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AMOUNT

OF A REFLECTOR ANTENNA IS DEVELOPED BY THIS PROJECT. AN ELECTRONICALLY CONTROLLABLE REFLECTIVE SURFACE BEING DEVELOPED ON A NASA SBIR IS THE STARTING POINT FOR THE WORK. THIS PROJECT EXTENDS THE PERFORMANCE OF THE SURFACE SO THAT IT IS USEFUL AS A NULL FORMER. THE RESULT IS CONSIDERABLY REDUCED COST OF NULL STEERING ANTENNAS. THE DEVICE FORMS PART OR ALL OF THE ANTENNA'S MAIN REFLECTOR OR ITS SUB-REFLECTOR. THE REFLECTIVE PHASE (AND AMPLITUDE IF REQUIRED) OF EACH SMALL PORTION OF THE UNIQUE SURFACE IS CONTROLLABLE SO THAT THE TOTAL PATTERN REFLECTED OFF THE SURFACE IS CONTROLLABLE. IN THIS PROJECT, THE USE OF THIS DEVICE TO FORM ANTENNA NULLS IS EXPLORED. THE NECESSARY DESIGN IMPROVEMENTS TO THE BASIC NASA SURFACE ARE DEVELOPED AND TOTAL ANTENNA PERFORMANCE USING THE DEVICE AS A NULL STEERER IS PREDICTED. PHASE 2 OF THIS PROJECT WILL VERIFY NULLING PERFORMANCE BY MEASUREMENTS.

COMPUTER TECHNOLOGY ASSOCS INC  
5670 S SYRACUSE CIRCLE - STE 200  
ENGLEWOOD, CO 80111  
RICHARD deJARDINS

AF

\$ 49,617

TITLE:

DISTRIBUTED C3I DATA BASE

T 38

OFFICE: ESD/XRCT

WE WILL DEVELOP, AND VERIFY THE FEASIBILITY OF, A DESIGN CONCEPT FOR A DISTRIBUTED DATABASE MANAGEMENT SYSTEM TO SUPPORT C3I IN THE YEAR 2000 TIME FRAME. THE DESIGN CONCEPT WE PROPOSE CONSISTS OF A RULE-BASED EXPERT SYSTEM FRONT END TO ADVANCED DISTRIBUTED DATABASE MANAGEMENT CAPABILITIES, OPERATING ON A DISTRIBUTED DATABASE DESIGNED SPECIFICALLY TO MEET SURVIVABILITY REQUIREMENTS. THE CONCEPT ADDRESSES THE KEY PROBLEMS OF: DATA REDUNDANCY IN A DISTRIBUTED ARCHITECTURE; DISTRIBUTED DATABASE RECOVERY, ESPECIALLY FROM NETWORK PARTITIONING; AND PRIORITIZATION OF SYSTEM ACTIVITIES AS A MECHANISM TO DEAL EFFECTIVELY WITH INFORMATION OVERLOAD.

COMPUTER TECHNOLOGY ASSOCS INC  
5670 S SYRACUSE CIR - STE 200  
ENGLEWOOD, CO 80111  
ROB BLUMBERG

NAVY

\$ 48,819

TITLE:

DATA FUSION TECHNOLOGY

T 54

OFFICE: NAVSEA

THE PURPOSE OF THIS SBIR IS TO INVESTIGATE AND DESCRIBE AN AUTOMATED

FISCAL YEAR 1986

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SYSTEM WHICH WILL ENABLE THE SHIP COMMANDING OFFICER TO OBTAIN PRE-  
CISE, RELEVANT DATA IN DECISION-ORIENTED FORMATS. THE CRITICAL RE-  
QUIREMENT FOR THIS SYSTEM IS THAT IT OPERATE IN A HIGHLY DECEN-  
TRALIZED, HETEROGENEOUS INFORMATION ENVIRONMENT. IN PHASE I OPERA-  
TION, FUNCTIONAL AND PERFORMANCE REQUIREMENTS WILL BE DESCRIBED AND  
THE OVERALL ARCHITECTURE WILL BE FORMULATED. THE KEY INNOVATION WILL  
BE TO COUPLE A GRAPHICAL INTERFACE TO SPATIAL DATA WITH A DATA FUSION  
SYSTEM. TWO DATABASE ARCHITECTURES WILL BE EVALUATED, THE COMPOSITE  
APPROACH AND THE FEDERATED MODEL. THE SYSTEM WILL EMBED A KNOWLEDGE  
BASE WHICH (1) RELATES QUERIES TO INFORMATION SOURCES RESIDING IN EX-  
TERNAL DATABASES (2) CONTAINS THE PROCEDURES FOR ACCESSING THE DATA.  
AS CONSULTANT, COMPUTER CORPORATION OF AMERICA WILL INVESTIGATE THE  
FEASIBILITY OF BUILDING ON ITS PREVIOUS WORK ON SPATIAL DATABASE  
MANAGEMENT SYSTEM (SDMS) FOR THE USS CARL VINSON, AND MULTIBASE.

CONSULTANT'S CHOICE INC 8601 DUNWOODY PL - STE 122 ATLANTA, GA 30338 H BENNETT TEATES TITLE: TACTICAL WEATHER EXPERT T 74 OFFICE: LABCOM/ASL	ARMY	\$ 73,158
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EFFECTIVE INTELLIGENCE PREPARATION OF THE BATTLEFIELD (IPB) MUST  
INCLUDE WEATHER PREDICTION, ANALYSIS, AND EFFECTS. IT IS WITHIN THE  
ARTIFICIAL INTELLIGENCE (AI) STATE-OF-THE-ART TO DEVELOP AN EXPERT  
SYSTEM FOR TACTICALLY DEPLOYED COMPUTERS TO ASSIST CORPS AND DIVISION  
STAFF PLANNERS IN DETERMINING AND INTEGRATING WEATHER EFFECTS INTO  
TACTICAL PLANNING. CCI WILL COMBINE A STATE-OF-THE-ART KNOWLEDGE-  
ENGINEERING TOOL WITH GRAPHICAL VISUAL DISPLAY AND DATA BASE MANAGE-  
MENT SYSTEM (DBMS) INTEGRATION TO DEMONSTRATE AND EVOLVE "EXPERT"  
ASSISTANCE FOR THE TACTICAL ENVIRONMENT.

COOPER COMPUTER SERVICES PO BOX 11286 SAN FRANCISCO, CA 94101 PETER G COOPER TITLE: VECTORIZATION OF TABS-3 T 204 OFFICE: WES	ARMY	\$ 31,667
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TABS-3 IS FORTRAN COMPUTER CODE FOR A FINITE ELEMENT MODEL OF THREE

FISCAL YEAR 1986

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DIMENSIONAL FLOW. THE CODE WAS DEVELOPED ON A PRIME 550, WHICH IS A SCALAR PROCESSOR. IT IS CURRENTLY BEING RUN ON A CYBER 205 AND HAS BEEN RUN ON A CRAY 1. IN ORDER TO REDUCE COSTS, THE CODE WILL BE VECTORIZED IN ORDER TO BETTER UTILIZE THE ARCHITECTURE OF VECTOR PROCESSOR. ATTEMPTS WILL BE MADE TO IMPLEMENT SPECIFIC CHANGES IN THE MACHINE NECESSARY FOR BOTH THE CYBER AND THE CRAY, AND TO SUGGEST CHANGES THAT ARE MACHINE DEPENDENT. MODIFICATIONS WILL INCLUDE REWRITING DO LOOPS, REARRANGEMENT OF MEMORY ACCESSES, SUBSTITUTION OF MEMORY FOR I/O, AND RESTAGING I/O DURING COMPUTATION.

COPROCESSOR CORP

ARMY

\$ 45,579

PO BOX 4593

FORT WALTON BEACH, FL 32549

DONALD J IMSAND

TITLE:

COMPUTER-AIDED JAMMING CALCULATIONS FOR RANGE AND DOPPLER  
CORRELATED RADARS

T 59

OFFICE: CECOM/AMSEL

THIS RESEARCH EFFORT WILL PRODUCE COMPUTER SOFTWARE WHICH CAN BE USED WITH AN MS-DOS COMPUTER TO 1) COMPUTE THE JAMMING PARAMETERS NECESSARY FOR JAMMING A CORRELATED RANGE/DOPPLER RADAR SYSTEM, 2) APPLY THOSE PARAMETERS IN A RADAR/ECM SIMULATION TO VERIFY THAT THE JAMMING PARAMETERS ARE EFFECTIVE, AND 3) DISPLAY RESULTS OF THE SIMULATED JAMMING PERFORMANCE BOTH GRAPHICALLY AND BY TABULAR PRINTOUT. THE SOFTWARE CODE WILL INCLUDE MODELS OR MODULES FOR THE TARGET, ENVIRONMENT, PULSE DOPPLER RADAR, ECM, AND OUTPUT DATA TABULATION AND GRAPHICS DISPLAY. MANY OF THE PARAMETERS OF THE MODELS AND MODULES WILL BE SELECTABLE BY THE USER FOR A GIVEN RUN. THE SOFTWARE WILL BE OF MODULAR CONSTRUCTION SO ADDITIONAL MODULES (E.G., ANTENNA, CLUTTER) CAN BE READILY ADDED TO INCREASE THE SIMULATION CAPABILITY AS REQUIRED. THE SOFTWARE WILL BE COMPLETELY DOCUMENTED INCLUDING USER INSTRUCTIONS.

CORDEC CORP

DARPA

\$ 49,985

PO BOX 188 - 8270-B CINDER BED RD

LORTON, VA 22079

DR RAYMOND J WEIMER

TITLE:

VANADIUM-GALLIUM HIGH-CURRENT HIGH-FIELD SUPERCONDUCTORS FABRICATION

T 6

OFFICE: DARPA

COMMERCIAL HIGH-FIELD SUPERCONDUCTORS ARE PRESENTLY BASED ON



FISCAL YEAR 1986

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NIOBIUM-TIN TAPE PRODUCED BY A CHEMICAL VAPOR DEPOSITION PROCESS. MAJOR DRAWBACKS INCLUDE HIGH-COST, MAGNETIC FIELDS. WE PROPOSE TO FABRICATE VANADIUM-GALLIUM SUPERCONDUCTING WIRES AND SHEETS USING NEW VAPOR DEPOSITION PROCESSES WE DEVELOPED FOR PRODUCING STRUCTURAL METAL MATRIX COMPOSITES. VANADIUM-GALLIUM SUPERCONDUCTORS NOT ONLY POSSESS HIGHER CRITICAL CURRENT DENSITIES, BUT THEY ARE FABRICATED FROM CONSTITUENTS REASONABLY ABUNDANT IN THE U.S. BOTH NIOBIUM AND TIN COME FROM FOREIGN SOURCES--AN IMPORTANT STRATEGIC MATERIALS CONSIDERATION. WIRES WILL BE FABRICATED IN DIAMETERS OF APPROXIMATELY 1.8 mm SQUARE MILLIMETER WITH TRANSITION TEMPERATURES TYPICALLY OF THE ORDER 16-18 K. UNIDIRECTIONAL SHEETS, 125 mm ON A SIDE, FABRICATED IN THICKNESSES OF APPROXIMATELY 0.25 mm, WILL HAVE SIMILAR AREAL DENSITIES (20,000 FILAMENTS PER cm OF WIDTH). CRITICAL TEMPERATURES, MECHANICAL PROPERTIES, AND MICROSTRUCTURES WILL BE EVALUATED AND USED TO SET GUIDELINES FOR A PHASE II SCALE-UP AND OPTIMIZATION OF THE PROCESSES.

CORDEC CORP  
8270-B CINDER BED RD  
LORTON, VA 22079  
DR RAYMOND J WEIMER

AF

\$ 49,986

## TITLE:

FABRICATION OF THIN-WALLED SEAMLESS TUBES FROM GRAPHITE/MAGNESIUM  
PRECURSOR TAPES

T 157

OFFICE: AFWAL/ML

THIN-WALLED TUBULAR STRUCTURES ARE EXTREMELY USEFUL FOR STRUTS AND JOINTS IN LIGHTWEIGHT TRUSSES FOR SPACE PLATFORMS, FOR ANTENNA SUPPORT SYSTEMS, AND, PERHAPS, EVEN FOR WAVEGUIDES. ON THE BASIS OF MASS-SPECIFIC PROPERTIES, GRAPHITE-FIBER-REINFORCED MAGNESIUM (GR/MG) COMPOSITES HAVE THE GREATEST POTENTIAL TO SATISFY AEROSPACE STRUCTURAL REQUIREMENTS FOR STRENGTH AND DIMENSIONAL STABILITY (STIFFNESS AND THERMAL EXPANSION). NEWLY DEVELOPED MANUFACTURING PROCESSES WILL BE USED TO PRODUCE GR/MG COMPOSITE PRECURSOR TAPES BY VAPOR DEPOSITION TECHNIQUES. THE FIBERS WILL BE PITCH-BASED CARBON AT A VOLUMEN FRACTION OF 0.5 AND CONFIGURED AS AN 8000-END TAPE. OUR PROCESS OFFERS ULTRA-THIN PLIES (0.0003 TO 0.0004 INCH, WITH EXCELLENT CONTROL OF FIBER VOLUME FRACTION, THEREBY, AFFORDING THE MATERIALS DESIGNER UNPRECEDENTED FLEXIBILITY IN SPECIFYING DIMENSIONAL STABILITY, MODULUS, OR STRENGTH IN LAMINAE AND FINAL PROPERTIES IN THE LAMINATED COMPOSITE STRUCTURE. THESE TAPES WILL BE FABRICATED INTO UNIDIRECTIONALLY

FISCAL YEAR 1986

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REINFORCED DEMONSTRATION TUBES APPROXIMATELY 12 INCHES IN LENGTH, ONE INCH IN DIAMETER, AND APPROXIMATELY 0.020 INCH IN WALL THICKNESS. PRELIMINARY CHARACTERIZATION OF THESE TUBES WILL ESTABLISH DESIGN GUIDELINES FOR A PHASE II OPTIMIZATION AND SCALE-UP OF THE PROCESS.

CORDEC CORP.  
8270-B CINDER BED RD., P.O. BOX 188  
LORTON, VA 22079  
RAYMOND J. WEIMER, PHD

SDIO

\$ 49,899

TITLE:

SILICON/CARBIDE TITANIUM COMPOSITE STRUCTURAL ELEMENTS FOR  
SPACE-BASED NUCLEAR POWER SOURCES

T 11 OFFICE:

THE ENORMOUS POWER REQUIREMENTS OF PROSPECTIVE TACTICAL AND STRATEGIC DEFENSE SYSTEMS IN SPACE WILL REQUIRE NUCLEAR REACTOR SYSTEMS, WHICH PRESENT A HOST OF MATERIALS ENGINEERING CHALLENGES DUE TO WEIGHT AND HIGH-TEMPERATURE PERFORMANCE. IN THE SP-100 SPACE-BASED 100-KILOWATT NUCLEAR REACTOR SYSTEM, PRELIMINARY DESIGN OF THE RADIATOR FRAME WAS BERYLLIUM, AND PROPERTY TRADE-OFF ANALYSES SHOWED THAT SILICON CARBIDE FIBER REINFORCED TITANIUM (SiC/Ti) COMPOSITE WAS AN ADVANTAGEOUS SUBSTITUTE MATERIAL. RECENT DEVELOPMENTS IN THE MANUFACTURE OF ULTRA-THIN METAL MATRIX COMPOSITE PRECURSOR TAPES BY PHYSICAL VAPOR DEPOSITION TECHNIQUES WILL BE EXPLOITED TO FABRICATE CONTINUOUS SiC/Ti TAPES AND FROM THESE TO CONSOLIDATE 60-PLY, 30-MIL SHEETS OF HIGH-QUALITY COMPOSITE MATERIAL. THESE TEST PANELS WILL BE CHARACTERIZED IN TERMS OF MECHANICAL PROPERTIES, DENSITIES, AND MICROSTRUCTURES. DESIGN GUIDELINES WILL BE ESTABLISHED FOR A PILOT SCALE PROCESS IN WHICH A PHASE II PARAMETRIC OPTIMIZATION CAN BE CARRIED OUT.

CORDEC CORP.  
8270-B CINDER BED RD.  
LORTON, VA 22079  
RAYMOND J. WEIMER, PHD

SDIO

\$ 49,891

TITLE:

SURVIVABILITY OF METAL MATRIX COMPOSITE SPACE STRUCTURES

T 7 OFFICE:

METAL MATRIX COMPOSITE (MMC) MATERIALS ARE BEING PROPOSED FOR

FISCAL YEAR 1986

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NUMEROUS STRUCTURAL ELEMENTS IN SPACE-BASED MISSILE DEFENSE SYSTEMS. THE VULNERABILITY OF SUCH NEW MATERIALS TO KINETIC AND DIRECTED ENERGY THREATS AND NUCLEAR BLAST EFFECTS IS NOT KNOWN. SUCH DATA IS CRUCIAL TO DEVELOPMENT OF HARDENING TECHNIQUES AND ENGAGEMENT STRATEGIES THAT ASSURE SUCCESSFUL DEPLOYMENT. GRAPHITE FIBER REINFORCED ALUMINUM COMPOSITES HAVE A DEMONSTRATED CAPACITY TO RETAIN STRENGTH AND STRUCTURAL INTEGRITY AFTER EXPOSURE TO HIGH ENERGY LASER RADIATION. THIS COMPOSITE, ALONG WITH GRAPHITE/MAGNESIUM AND GRAPHITE/COPPER, COMPRISES MOST OF THE ANTICIPATED STRUCTURAL APPLICATIONS. IN PHASE I, THESE NEW THIN-GAUGE MMC'S MANUFACTURED BY VAPOR DEPOSITION METHODS WILL BE CHARACTERIZED BEFORE AND AFTER EXPOSURE TO HIGH ENERGY LASER RADIATION. DAMAGE ASSESSMENT WILL SUGGEST AVENUES FOR FURTHER DEVELOPMENTS, SUCH AS PROTECTIVE COATINGS. SUITABILITY FOR USE IN PRIMARY STRUCTURES OR AS SHIELDING MATERIAL WILL BE EVALUATED. A PRELIMINARY ASSESSMENT OF OTHER THREATS WILL BE USED TO FORMULATE A PHASE II STRATEGY FOR DEVELOPING A MEANINGFUL DESIGN DATA BASE ON THESE MATERIALS.

CORDEC CORP.  
8270-B CINDER BED RD.  
LORTON, VA 22079  
RAYMOND J. WEIMER, PHD  
TITLE:

SDIO

\$ 49,828

METAL MATRIX COMPOSITE BARREL MATERIALS FOR ELECTROMAGNETIC RAIL GUNS

T 2 OFFICE:

COPPER ALLOY ELECTRODES IN ELECTROMAGNETIC RAIL GUNS SUFFER UN-ACCEPTABLE EROSION DAMAGE DURING FIRING. MOREOVER, THE LACK OF HIGH TEMPERATURE STRENGTH AND DIMENSIONAL STABILITY DEGRADE THE ACCURACY OF THE GUN. RECENT DEVELOPMENTS IN PHYSICAL VAPOR DEPOSITION TECHNIQUES HAVE MADE POSSIBLE SOME NOVEL APPROACHES TO THESE PROBLEMS. ION-PLATED GRAPHITE/COPPER COMPOSITES WILL BE FABRICATED WITH P-100 CARBON FIBERS. IN ADDITION TO ZERO COEFFICIENT OF THERMAL EXPANSION, A YOUNG'S MODULUS OF ABOUT 415 GPa (60 Msi) IS ANTICIPATED AT A TENSILE STRENGTH OF ABOUT 1.4 GPa (200 ksi). AN ION-PLATED TUNGSTEN COATING ON THIS COMPOSITE WILL SERVE AS A PROTOTYPE OF CONDUCTIVE REFRACTORY WEAR COATINGS. HIGH ENERGY LASER RADIATION WILL BE EVALUATED AS A MATERIAL SCREENING TOOL FOR GUN RAIL IMPROVEMENTS BY ESTABLISHING DAMAGE THRESHOLDS ON ACTUAL MATERIALS. ALL MATERIALS WILL BE CHARACTERIZED IN TERMS OF MECHANICAL PROPERTIES AND MICROSTRUCTURES.

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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SCANNING ELECTRON MICROSCOPY WILL BE USED TO OBTAIN TENSILE FRACTO-  
GRAPHS AND TO EXAMINE THE TYPE AND LOCUS OF THERMAL DAMAGE.  
PRELIMINARY MATERIAL DESIGN GUIDELINES WILL BE ESTABLISHED FOR A  
PHASE II DEVELOPMENT EFFORT THAT ADDRESSES BULK AND SURFACE MODIFIERS  
THAT FURTHER IMPROVE PERFORMANCE.

CORIOLIS CORP 15315 SOBEY RD SARATOGA, CA 95070 ARTHUR H IVERSEN TITLE: HIGH POWER MICROFOCUS X-RAY TUBE FOR REAL TIME AND COMPUTERIZED INSPECTION T 159	AF	\$ 49,850
OFFICE: AFWAL/ML		

A SUCCESSFUL COMPLETED SBIR PHASE I PROGRAM DEMONSTRATED A NEW CLASS  
OF LIQUID COOLED X-RAY TUBE ANODE HEAT EXCHANGE SURFACES SUITABLE FOR  
USE IN LIQUID COOLED HIGH POWER MICROFOCUS ROTATING ANODE X-RAY  
TUBES. SUCH A CONTINUOUS DUTY TUBE CAN BE EXPECTED TO HAVE ABOUT 20  
X MORE POWER THAN CURRENTLY USED FIXED ANODE TUBES. IN GENERAL, THIS  
POWER INCREASE TRANSLATES DIRECTLY INTO ABOUT A 20 X INCREASE IN SYS-  
TEM THROUGHPUT FOR COMPUTERIZED AND FILM INSPECTION TECHNIQUES AND  
HIGH THROUGHPUT AND SUPERIOR IMAGES (INCREASED COUNTING STATISTICS  
FOR IMPROVED CONTRAST) FOR REAL TIME BLADE OR MOTOR INSPECTION SYS-  
TEMS. THIS PHASE I PROGRAM WILL DEVELOP AND DEMONSTRATE A LONG-LIVED  
(500 HR. MINIMUM) MICROFOCUS ELECTRON GUN SUITABLE FOR HIGH KV (200-  
300 KV) ANALOG AT A SCALED VOLTAGE CONSISTANT WITH FIXED ANODE USE.  
THE GOAL OF THE PHASE I PROGRAM IS TO DEVELOP AN ELECTRON GUN WHICH  
WILL PROVIDE 14MA INTO A 0.2MM MICRO FOCAL SPOT. THE ELECTRON GUN  
WILL BE CAPABLE OF DEVELOPING A POWER LEVEL OF 2,000 WATTS (20 DEG  
TARGET ANGLE) OR 3,000 WATTS (13 DEG TARGET ANGLE) AT MAXIMUM  
300 KV OPERATION.

COVALENT TECHNOLOGY CORP PO BOX 1868 -3941 RESEARCH PK DR ANN ARBOR, MI 48106 DR MICHAEL G PAPPAS TITLE: RAPID DIPSTICK DOT-ELISA FOR LEPTOSPIROSIS T 210	ARMY	\$ 49,886
OFFICE: AMRDC/SGRD		

LEPTOSPIROSIS IS AN ACUTE, FEBRILE, POTENTIALLY FATAL BACTERIAL

FISCAL YEAR 1986

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INFECTION IN MAN. THE OBJECTIVES OF THIS PROJECT ARE TO 1) DEVELOP A DIPSTICK DOT IMMUNOBINDING ASSAY (DOT-ELISA) FOR RAPID AND ECONOMICAL DETECTION OF SERUM ANTIBODIES TO PATHOGENIC SEROVARS OF LEPTOSPIRA INTERROGANS, 2) EVALUATE THE DOT-ELISA USING HUMAN SERA HAVING ANTIBODIES TO SEROVARS OF L. INTERROGANS, 3) OPTIMIZE TEST COMPONENTS SUCH AS PATIENT SERUM DILUTION, ENZYME-CONJUGATED ANTIBODY, AND SUBSTRATES, AND 4) DETERMINE ASSAY CROSS-REACTIVITY USING SERA FROM PATIENTS WITH OTHER DISEASES. THE DEVELOPMENT OF A DIPSTICK DOT-ELISA FOR L. INTERROGANS WILL REPRESENT A SIGNIFICANT IMPROVEMENT OVER EXISTING CULTURE METHODS AND DIAGNOSTIC TESTS WHICH ARE TEDIOUS, TIME-CONSUMING, AND EXPENSIVE. THIS RAPID, VISUALLY READ TEST REQUIRES MINIMAL TECHNICAL SKILL, NO LABORATORY EQUIPMENT, AND IS COST-EFFECTIVE; THE REACTED DIPSTICK MAY BE KEPT AS A PERMANENT RECORD. THE SIMPLICITY, SAFETY AND VERSATILITY OF THE DIPSTICK DOT-ELISA MAKES THIS ECONOMICAL PROCEDURE ESPECIALLY AMENABLE TO COMMERCIAL APPLICATION FOR USE BY PHYSICIANS IN HOSPITALS AND SMALL CLINICS TO DETECT HUMAN LEPTOSPIROSIS AND BY VETERINARIANS IN THE FIELD FOR DIAGNOSIS OF THIS DISEASE IN LIVESTOCK.

CRAIG DEVELOPMENT CORP  
7767 E QUAKER RD  
ORCHARD PARK, NY 14127  
DWIGHT R CRAIG

DARPA \$ 50,000

TITLE:

SMALL HIGH POWER HIGH ENERGY DENSITY BATTERIES

T 9 OFFICE: DARPA

THE MILITARY SERVICES ARE IN CONSTANT NEED OF IMPROVEMENTS IN PERFORMANCE OF ALL TYPES OF BATTERIES. NORMALLY, THESE IMPROVEMENTS COME IN THE FORM OF SMALL EVOLUTIONARY CHANGES IN PRODUCTION METHODS AND MATERIALS, AND OCCASIONALLY AS A STEPWISE CHANGE DUE TO USE OF A NEW BASIC MATERIAL. THE PRESENT SOLICITATION TOPIC SEEKS A NEW APPROACH THAT WILL PRODUCE ANOTHER STEP IMPROVEMENT, OR HOPEFULLY, EVEN A QUANTUM JUMP IN PERFORMANCE. THE ENCLOSED PROPOSAL DESCRIBES AN INNOVATIVE CONCEPT FOR BATTERIES THAT OFFERS A FULL QUANTUM LEAP IN PERFORMANCE. FEASIBILITY HAS BEEN SHOWN FOR THIS BATTERY AT Wh/#, OVER 10,000 W/#, 13 Wh/cu. in., AND SHORT-TERM OR INTERMITTENT DISCHARGE AT EXTREMES OF TEMPERATURE. IT IS A SECONDARY BATTERY, BELIEVED TO BE CAPABLE OF BEING STORED FULLY CHARGED, OR OF BEING INTERMITTENTLY OR FULLY DISCHARGED, OVER A LONG PERIOD OF TIME. IT IS PROPOSED HERE TO DEMONSTRATE THAT LONG STORAGE OR DISCHARGE

FISCAL YEAR 1986

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PERIODS ARE INDEED FEASIBLE WITH THIS NEW BATTERY.

CRC-EVANS PIPELINE INTERNATIONAL INC 11601 N HOUSTON-ROSSLYN RD HOUSTON, TX 77086 MILTON D RANDALL TITLE: INTELLIGENT WELD PROCESS CONTROL SYSTEM T 66 OFFICE: NAVSEA	NAVY	\$ 88,500
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A RESEARCH PROGRAM IS PROPOSED TO ESTABLISH THE FEASIBILITY OF COMBINING THE COMPREHENSIVE RULE-BASE OF AN EXPERT ARC WELDING SYSTEM WITH SENSORY FEEDBACK AND CONTROL ALGORITHMS TO INITIALLY SET AND ADAPTIVELY CONTROL THE WELD PROCESS IN A CHANGING ENVIRONMENT. IT WILL BE THE OBJECTIVE OF THE PROPOSED RESEARCH TO DEMONSTRATE THE FEASIBILITY OF ACCOMPLISHING THIS FOR BOTH CONVENTIONAL JOINTS AND NARROW GAP JOINTS WELDED WITH THE GAS TUNGSTEN ARC, GAS METAL ARC, OR SUBMERGED ARC WELDING PROCESSES. A FURTHER OBJECTIVE OF THE OVERALL RESEARCH EFFORT WILL BE TO ESTABLISH THE FEASIBILITY OF NOT ONLY ADAPTIVELY CONTROLLING THE WELD PROCESS BUT OF PROVIDING REAL TIME MONITORING AND QUALITY CONTROL AS WELL. THE RESEARCH WILL FURTHER RESULT IN A MORE FUNDAMENTAL UNDERSTANDING OF THE ARC WELD PROCESSES, PARTICULARLY IN THE FORM OF STOCHASTIC AND DYNAMIC MODELS.

CREARE INC PO BOX 71 - ETNA RD HANOVER, NH 03755 DR BHARATAN PATEL TITLE: AN EXPERT ASSISTANT FOR COMPUTATIONAL FLUID DYNAMICS T 43 OFFICE: AVSCOM/AMSAV	ARMY	\$ 55,544
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CREARE WILL EVALUATE THE FEASIBILITY OF USING KNOWLEDGE-BASED SOFTWARE, IN THE FORM OF AN EXPERT ASSISTANT, TO ENHANCE THE FUNCTIONALITY OF COMPUTATIONAL FLUID DYNAMICS (CFD) SOFTWARE. WE WILL EXAMINE VARIOUS ASPECTS OF CFD AND IDENTIFY AREAS IN WHICH HUMAN EXPERTISE CAN MAKE A SIGNIFICANT CONTRIBUTION. WE WILL MEASURE THE EFFECTS OF APPLYING SUCH EXPERTISE ON TIME REQUIRED FOR PROBLEM SETUP, TIME REQUIRED FOR PROBLEM SOLUTION, AND QUALITY AND CORRECTNESS OF RESULTS. WE WILL APPLY KNOWLEDGE-ENGINEERING TECHNIQUES TO

FISCAL YEAR 1986

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DESCRIBE THE NATURE OF THIS EXPERTISE AS "DOMAIN KNOWLEDGE", AND WILL DETERMINE THE APPROPRIATENESS OF USING A KNOWLEDGE-BASED SYSTEM TO ADD SUCH EXPERTISE TO A CFD CODE, AS AN AID TO THE USER.

CREARE, INC. P.O. BOX 71, ETNA RD. HANOVER, NH 03755 JAVIER A. VALENZUELA TITLE: LIGHT WEIGHT, REMOTELY DEPLOYABLE HEAT PIPE RADIATOR T 4 OFFICE:	SDIO	\$ 49,529
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THE HEAT REJECTION NEEDS OF SPACECRAFT ARE PROJECTED TO INCREASE BY ORDERS OF MAGNITUDE OVER THE COMING DECADES AS BOTH MILITARY AND CIVILIAN SPACE MISSIONS OPERATE AT GREATER POWER LEVELS. ADVANCED SPACE RADIATOR SYSTEMS WILL NEED TO BE DEVELOPED TO MEET THOSE NEEDS. BECAUSE OF THE LARGE RADIATING SURFACE REQUIRED, THESE ADVANCED RADIATOR SYSTEMS WILL NEED TO BE CONSTRUCTED OR DEPLOYED IN SPACE. A NOVEL DESIGN FOR SUCH A RADIATOR MODULE IS PROPOSED, WHICH HAS THE POTENTIAL FOR SIGNIFICANT REDUCTIONS IN WEIGHT, AND INCREASES IN PERFORMANCE. A UNIQUE FEATURE OF THE DESIGN IS THAT THE RADIATOR CAN BE TRANSPORTED COMPACTLY AND THEN REMOTELY DEPLOYED IN SPACE. PHASE I OF THIS PROJECT WILL ASSESS THE FEASIBILITY OF THE PROPOSED CONCEPT BY PERFORMING A PROOF-TO-CONCEPT EXPERIMENT AND DEVELOPING SCOPING ANALYSES TO PREDICT THE EXPECTED THERMAL PERFORMANCE OF THE RADIATOR. IF PROVEN FEASIBLE, A PROTOTYPE HEAT PIPE RADIATOR WILL BE BUILT AND TESTED IN PHASE II.

CREARE, INC. P.O. BOX 71, ETNA RD. HANOVER, NH 03755 PAUL H. ROTHE, PHD TITLE: CRYOGENICALLY COOLED PULSED CONDUCTOR T 2 OFFICE:	SDIO	\$ 99,964
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THE OPERATION OF ELECTROMAGNETIC LAUNCHERS AT CRYOGENIC TEMPERATURES POTENTIALLY OFFERS HIGHER EFFICIENCY OF PROPULSION AND RATE OF FIRING. ASSESSMENT OF THE FEASIBILITY AND OPERABILITY OF CRYOGENIC E-M LAUNCHERS IS HINDERED, HOWEVER, BY THE LACK OF RELEVANT EXPERI-

FISCAL YEAR 1986

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ENCE. DURING PHASE I, WE WILL DEVELOP THE FOUNDATION FOR THE DEMONSTRATION LAUNCH OF A CRYOGENIC RAIL GUN.

CREARE, INC. P.O. BOX 71, ETNA RD. HANOVER, NH 03755 PAUL H. ROTHE, PHD TITLE: MATERIALS DEVELOPMENT FOR PULSED CONDUCTORS T 2 OFFICE:	SDIO	\$ 53,973
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THE PROPOSED PROJECT WILL DEVELOP MATERIALS AND SUPPORTING THERMAL TECHNOLOGY LEADING TO DESIGN OF HIGH POWER PULSE CONDUCTORS FOR SPACE APPLICATIONS. IN PHSE I WE WILL EVALUATE AN EM GUN SYSTEM, IDENTIFY ALTERNATIVE MATERIALS AND THERMAL APPROACHES FOR SELECTED COMPONENTS, AND IDENTIFY TECHNOLOGY REQUIREMENTS. COMPONENT DEVELOPMENT FEASIBILITY AND BENEFITS WILL BE DEFINED.

CREARE, INC. P.O. BOX 71, ETNA RD. HANOVER, NH 03755 HERBERT SIXSMITH, PHD TITLE: WET TURBOEXPANDER FOR CRYOCOOLERS OF SPACEBORNE SURVEILLANCE SENSORS T 3 OFFICE:	SDIO	\$ 64,153
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THE NEED FOR INCREASING THE SENSITIVITY OF SPACE-BORNE SENSORS WILL REQUIRE DEVELOPMENT OF LONG-LIFE, HIGHLY EFFICIENT HELIUM LIQUIFIERS. CONVENTIONAL HELIUM LIQUIFIERS EMPLOY A JOULE-THOMSON EXPANSION VALVE TO EXPAND THE HELIUM AT TEMPERATURES BELOW ABOUT 10 DEG K. IT HAS BEEN SHOWN THAT GAINS OF UP TO 30% IN OVERALL CYCLE EFFICIENCY CAN BE OBTAINED IF THE JOULE-THOMSON VALVE IS REPLACED BY AN EXPANSION ENGINE OR AN EXPANSION TURBINE. THIS EFFICIENCY GAIN TRANSLATES INTO A MAJOR REDUCTION IN COMPRESSOR POWER AND RADIATOR WEIGHT. BECAUSE OF RELIABILITY AND VIBRATION CONSIDERATIONS IT WOULD BE HIGHLY DESIREABLE TO USE MINIATURE "WET" TURBOEXPANDERS INSTEAD OF RECIPROCATING EXPANSION ENGINES. THIS PROPOSAL DESCRIBED PHASE I OF A PROJECT TO DEVELOP AND TEST A "WET" CRYOGENIC TURBOEXPANDER OPERATING IN GAS BEARINGS. THE PRINCIPAL FEATURES OF THE PROPOSED DESIGNS ARE SU-



FISCAL YEAR 1986

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PERIOR RELIABILITY AND HIGH EFFICIENCY. PHASE I OF THE PROGRAM WILL CONSIST OF ESTABLISHING SPECIFICATIONS FOR THE WET TURBOEXPANDERS AND PERFORMING PRELIMINARY FLUID DYNAMIC AND MECHANICAL DESIGNS IN ORDER TO DETERMINE THE TECHNICAL FEASIBILITY OF EMPLOYING A GAS BEARING TURBOEXPANDER AS A "WET" EXPANDER.

CREARE, INC.

SDIO

\$ 63,245

P.O. BOX 71, ETNA RD.

HANOVER, NH 03755

HERBERT SIXSMITH, PHD

TITLE:

GENERIC LONG LIFE CIRULATOR FOR SPACECRAFT THERMAL CONTROL

T 5 OFFICE:

FORCED CIRCULATION COOLING SYSTEMS FOR EFFICIENTLY CARRYING SPACECRAFT WASTE HEAT LOADS TO THE RADIATOR ARE EMERGING AS THE APPROACH OF CHOICE IN A TREND OF RISING POWER LEVELS. RELIABLE LONG LIFE COOLANT CIRCULATORS CAPABLE OF SATISFYING A WIDE RANGE OF COOLANT TYPES, FLOW RATES, AND HEADS AT VARIOUS TEMPERATURES DO NOT PRESENTLY EXIST. THIS PROPOSAL DESCRIBES A DEVELOPMENT PROGRAM TO PRODUCE A GENERIC CENTRIFUGAL CIRCULATOR CAPABLE OF PROVIDING RELIABLE LONG TERM CIRCULATION OF LIQUID AND GASEOUS COOLANTS IN THE SPACE ENVIRONMENT. THE DESIGN INCORPORATES A HIGH SPEED INDUCTION MOTOR AND SELF ACTING GAS BEARINGS OF THE TILTING PAD TYPE. THIS APPROACH REPRESENTS A SUBSTANTIAL IMPROVEMENT IN PERFORMANCE AND RELIABILITY AND AN ORDER OF MAGNITUDE INCREASE IN PUMPING CAPACITY OVER EXISTING MAGNETIC BEARING UNITS, ALONG WITH SIGNIFICANT SYSTEM WEIGHT SAVINGS.

CREATIVE OPTICS INC

ARMY

\$ 49,997

32 WILDWOOD DR

BEDFORD, MA 01730

DR JOHN F EBERSOLE

TITLE:

NOVEL TECHNIQUE FOR SMART SENSOR TESTING AND EVALUATION

T 160 OFFICE: TECOM

COI PROPOSES TO DEVELOP A TECHNIQUE FOR PLANNING FIELD TRIAL TEST OF SURVEILLANCE RECONNAISSANCE SMART SENSORS WHICH WILL (1) MAXIMIZE THE INFORMATION RESULTING FROM A TRIAL, AND (2) MINIMIZE THE NUMBER OF FIELD TRAILS REQUIRED TO ASSESS PERFORMANCE. WE UTILIZE TARGET AND

FISCAL YEAR 1986

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BACKGROUND SIGNATURES AND PROPRIETARY COI ALGORITHMS TO SELECT EFFICIENT SERIES OF TESTS WHICH COVER ALL SIGNIFICANT FIELD VARIABLES. PHASE I WORK WILL DEMONSTRATE THE VALIDITY AND PRACTICALITY OF OUR TECHNIQUE.

CRIMMINS A G  
1305 FAIRBOURNE CT  
LANSDALE, PA 19446  
ARTHUR G CRIMMINS

NAVY

\$ 49,895

TITLE:

THE QUILL KEYBOARD REPLACEMENT SYSTEM

T 94

OFFICE: NSWC/DL

THE FIRST PROJECT OBJECTIVE IS TO IDENTIFY THE PRODUCTIVITY ADVANTAGES OF A NEW APPROACH TO THE "KEYBOARD" PROBLEM OF TYPEWRITERS AND COMPUTERS, AND, MOST IMPORTANT, A COMPUTERIZED METHOD OF TEACHING THIS SYSTEM. TWO HANDGRIPS WITH FIVE FINGER ACTUATED SWITCHES ARE USED. THUS, 1,024 (2(10) INDIVIDUAL BINARY COMMANDS ARE AVAILABLE WITHOUT THE HAND MOVEMENTS NEEDED WITH STANDARD KEYBOARD SYSTEMS WHILE THE OPERATOR RETAINS POSITIONAL CONTROL OF THE HANDGRIPS. PRODUCTIVITY MAY BE IMPROVED BY A FULL ORDER OF MAGNITUDE. THE SECOND PROJECT OBJECTIVE IS TO DEFINE A SYSTEM THAT WILL PROVIDE THE OPERATOR OF A VEHICLE OR WEAPON SYSTEM WITH OVER 1,000 SEPARATE COMMANDS DIRECTLY FROM HANDGRIPS. A HELICOPTER PILOT COULD SELECT ELECTRONIC SYSTEMS, RADIO CHANNELS AND CALL UP SPECIFIC DATA DISPLAYS WITHOUT TAKING HIS HANDS OFF THE CONTROLS. A PRIMARY OBJECTIVE COMMON TO BOTH OF THE ABOVE IS THE DEFINITION OF THE TRAINING/-RETRAINING PROGRAM THAT MUST BE INVESTIGATED VIS A VIS THE AVERAGE USER. THESE OBJECTIVES WILL BE ACHIEVED BY CONSTRUCTION AND OPERATION OF A PROOF-OF-CONCEPT MODEL WITH TWO HANDGRIPS (INCORPORATING MOVABLE "BUTTONS" UNDER THE COMMAND OF THE TEAHING PROGRAM) INTERFACE WITH A STANDARD IBM PERSONAL COMPUTER WITH AUDIO/VISUAL SUPPORT.

CRITES ENTERPRISES  
PO BOX 13651  
ST LOUIS, MO 63138  
ROGER C CRITES

AF

\$ 47,890

TITLE:

THIN FILM ELECTRET BOUNDARY LAYER TRANSITION DETECTOR

T 292

OFFICE: AEDC/DOT

A STUDY IS PROPOSED TO DETERMINE THE FEASIBILITY OF DEVELOPING AN

FISCAL YEAR 1986

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ECONOMICAL NON-INTRUSIVE BOUNDARY LAYER TRANSITION DETECTOR. THE NEW DETECTOR CONCEPT IS BASED ON THE "ELECTRET FLUCTUATING PRESSURE TRANSDUCER", WHICH WAS INVENTED AND PATENTED BY THE PRINCIPLE INVESTIGATOR FOR THIS TASK. THE ELECTRET TRANSDUCER IS MADE FROM THIN (0.0003 INCH) LAYERS OF SPECIALLY PREPARED AND ELECTRICALLY POLARIZED PLASTIC FILM. THE TRANSITION DETECTOR WOULD CONSIST OF A THIN (0.001 TO 0.003 INCH) PLASTIC SHEET WITH A LARGE IMBEDDED ARRAY OF MINIATURE ELECTRET TRANSDUCERS. IN THE WIND TUNNEL (OR FLIGHT TEST), THE SHEET WOULD BE BONDED TO THE MODEL SURFACE. THE MULTIPLEXED OUTPUT OF THE DETECTOR WOULD BE AN RMS FLUCTUATING PRESSURE MAP OF THE SURFACE. IT IS A WELL KNOWN FACT THAT TURBULENT BURSTS IN THE TRANSITIONAL BOUNDARY LAYER CREATE A CHARACTERISTIC SPIKE IN THE FLUCTUATING SURFACE PRESSURE INTENSITY. THE PROPOSED THIN FILM DEVICE WOULD DETECT TRANSITION BY REVEALING THIS SPIKE. IN ADDITION TO BOUNDARY LAYER INVESTIGATIONS, THE PROPOSED THIN FILM TRANSDUCER ARRAY SHOULD FIND USE IN THE STUDY OF AERODYNAMIC NOISE, PANEL FLUTTER, AND BUFFET.

CRYOPOWER ASSOC	SDIO	\$ 54,661
P.O. BOX 831		
LOS ALAMOS, NM 87544		
HENRY L LAGUER		
TITLE:		
SUPERCONDUCTING INDUCTIVE ENERGY STORAGE AT 14K		
T 5 OFFICE:		

INDUCTIVE ENERGY STORAGE OFFERS A MEANS OF GENERATING HIGH PEAK POWER PULSES FROM A LOW POWER SOURCE. THE MAXIMUM POSSIBLE POWER AMPLIFICATION INCREASES WITH THE TIME CONSTANT OF THE INDUCTOR. SUPERCONDUCTING CIRCUITS OFFER INFINITE TIME CONSTANTS. HOWEVER, REFRIGERATION TO MAINTAIN THE SUPERCONDUCTOR AT ITS REQUIRED TEMPERATURE USES ENERGY, BUT THE HIGHER THIS TEMPERATURE, THE LOWER THE POWER CONSUMPTION OF THE REFRIGERATOR. MANY SDI SYSTEMS WILL HAVE ON BOARD LARGE SUPPLIES OF LIQUID HYDROGEN. IF A SUPERCONDUCTOR CAN BE DEVELOPED THAT FUNCTIONS EFFECTIVELY IN LIQUID HYDROGEN, AND IF THE REFRIGERATION FOR THE SUPERCONDUCTOR CAN BE TIED TO THAT OF THE LIQUID HYDROGEN THE ENTIRE SYSTEM WOULD BE MORE EFFICIENT. THIS POTENTIAL SYNERGISM FOR SUPERCONDUCTIVE ENERGY STORAGE ON AN SDI SPACECRAFT MERITS EXPLORATION. WE PROPOSE TO ANALYZE CONFIGURATION OPTIONS, STABILITY, STABILIZATION REQUIREMENTS, AND OVERALL PERFORMANCE OF MULTI-FILAMENTARY Nb<sub>3</sub>Sn SUPERCONDUCTORS IN THE 14 TO 16 K TEMPERATURE REGION AND TO EXPLORE THE EFFECTS THIS ENERGY STORAGE

FISCAL YEAR 1986

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OPTION COULD HAVE ON SOME SDI MISSIONS.

CURTIS WADE ENGINEERING CORP 17551 LINDA LANE TUSTIN, CA 92680 WALTER C DAVIS TITLE: ACCURATE VELOCITY VECTOR MEASUREMENT SYSTEM T 87 OFFICE: NAVAIR	NAVY	\$ 52,644
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A NEW CONCEPT IS PROPOSED THAT COMBINES THE ADVANTAGES OF NARROW-BEAM OPTICAL SYSTEMS WITH THE LOW BANDWIDTH REQUIREMENTS OF LOW-FREQUENCY SYSTEMS. THE OBJECTIVE OF THE PHASE I WORK IS TO PROVE THE TECHNICAL FEASIBILITY OF DEVELOPING AN ACCURATE, COMPACT, SIMPLE, AND HIGHLY RELIABLE OPTICAL VELOCIMETER THAT WILL BE CAPABLE OF MEASURING THE VELOCITY VECTORS OF AIRCRAFT BEING CATAPULTED FROM AIRCRAFT CARRIERS AND THE SPEED AND SINK RATE ON TOUCHDOWN AND ARRESTMENT. THE INITIAL ANALYSIS AND EXPERIMENTAL WORK WILL RESULT IN THE PRELIMINARY SYSTEM DESIGN AND IN A DETERMINATION OF THE MAXIMUM OPERATING RANGE AND THE VELOCITY ACCURACY OF THE SYSTEM. THE RESULTS OF PHASE I OF THE RESEARCH SHOULD PROVIDE THE DESIGN SPECIFICATIONS FOR A FULL SYSTEM TO BE BREADBOARDED AND FULLY TESTED IN PHASE II.

CVD, INC 185 NEW BOSTON ST WOBURN, MA 01801 MICHAEL A PICKERING, PHD TITLE: OPTICAL SURVIVABILITY COATING DEVELOPMENT T 7 OFFICE:	SDIO	\$ 49,841
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THE SURVIVABILITY OF THE VARIOUS COMPONENTS OF A SPACE-BASED MISSILE DEFENSE SYSTEM IS CRITICAL TO ITS EFFECTIVENESS. INFRARED (IR) SYSTEMS USED TO DETECT, ACQUIRE AND TRACK SPACE OBJECTS AND BALLISTIC MISSILES ARE PARTICULARLY VULNERABLE TO DIRECTED ENERGY WEAPONS (LASERS). ONE HARDENING TECHNIQUE THAT CAN BE USED TO PROTECT THESE OPTICAL SYSTEM IS TO PLACE A FILTER AT AN APPROPRIATE POSITION IN THE OPTICAL TRAIN WHICH WILL ABSORB THE NARROW BAND LASER ENERGY BUT OTHERWISE TRANSMIT THE WIDE BAND INFRARED SIGNALS. IN THIS PROPOSED PHASE I PROGRAM, THE FEASIBILITY OF PRODUCING RUGATE FILTERS, BY

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>CODEPOSITING ZnS AND ZnSe IN A CONTROLLED CHEMICAL VAPOR DEPOSITION (CVD) PROCESS, WILL BE INVESTIGATED. THIS WILL BE ACCOMPLISHED BY ESTABLISHING THE DEPOSITION PARAMETERS, I.E., TEMPERATURE, FLOW RATES AND PRESSURE, NECESSARY TO PRODUCE PERIODIC INDEX PROFILES OVER SPATIAL DISTANCES USEFUL FOR NARROW BAND NOTCH FILTERS. THIS TYPE OF FILTER, WHICH IS MADE UP OF CHEMICALLY SIMILAR MATERIALS, I.E., <math>\text{ZnS}(x)\text{Se}(1-x)</math>, IS EXPECTED TO HAVE HIGHER DAMAGE THRESHOLDS AND OPTICAL DENSITIES THAN DISCRETE DIELECTRIC FILTERS.</p>		

CYBERMATION INC 5457 JAE VALLEY RD ROANOKE, VA 24014 JOHN M HOLLAND TITLE: OPTIMIZED MOBILE ROBOT FOR RESEARCH AND DEVELOPMENT T 14 OFFICE: DARPA	DARPA	\$ 46,433
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MOBILE ROBOTS DIFFER FROM CONVENTIONAL VEHICLES IN THAT THEY ARE DRIVEN BY COMPUTERS AND NOT BY HUMANS. THIS FACT HAS PROFOUND IMPLICATIONS BEARING ON THE BASIC DESIGN OF THE VEHICULAR PART OF THE ROBOT. HUMAN DRIVERS HAVE EXCELLENT SENSORY CAPABILITIES WHICH ARE THOROUGHLY INTEGRATED TO A HIERARCHIAL, SELF RESTRUCTURING NERVOUS SYSTEM. TODAY'S TECHNOLOGY CAN PROVIDE MOBILE ROBOTS WITH ONLY A SHADOW OF THESE CAPACITIES. BEFORE BEGINNING TO STUDY THE BASIC STRUCTURES OF ARTIFICIAL INTELLIGENCE, SENSORY INTEGRATION, AND CONTROL IT IS ESSENTIAL TO FIRST STRIP AWAY ALL UNNECESSARY ENCUMBERMENTS POSED BY THE VEHICLE AND ITS SUPPORT SYSTEM. AT THIS POINT, A LARGE NUMBER OF MOBILE ROBOT RESEARCH PROJECTS HAVE BEEN UNDERTAKEN, AND A WEALTH OF PRACTICAL KNOWLEDGE IS SPREAD AMONG THESE GROUPS. CYBERMATION, AS ONE OF THE FIRST MANUFACTURERS OF INDUSTRIAL QUALITY MOBILE ROBOTS, HAS ALSO GAINED SIGNIFICANT INSIGHTS INTO THE REQUIREMENTS FOR SUCH MACHINES. A STUDY IS PROPOSED THAT WILL CANVAS AS MANY EXPERIENCED GROUPS AS POSSIBLE, IN ORDER TO DETERMINE THE IDEAL CHARACTERISTICS FOR A RESEARCH VEHICLE. THESE CHARACTERISTICS WILL THEN BE USED TO GENERATE A DESIGN SPECIFICATION FOR AN OPTIMAL PLATFORM.

CYTEC INC (AKA CYTOLOGY TECHNOLOGY) PO BOX 57462 WEBSTER, TX 77598 DR TOD S JOHNSON TITLE: FLOW CYTOMETRIC DETECTION OF NATURAL AND MILITARY RELATED TOXIC CELLULAR DNA DAMAGE AND DISEASES T 210 OFFICE: AMRDC/SGRD	ARMY	\$ 49,910
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THE OBJECTIVE OF THIS PHASE I SBIR PROJECT IS TO STUDY TECHNICAL/

FISCAL YEAR 1986

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METHODOLOGICAL ASPECTS, PERFORMANCE CRITERIA FOR ANEW CLINICAL SPECIMEN TOXICITY TEST. STATE-OF-THE-ART FLOW CYTOMETRIC/MONOCLONAL ANTIBODY TECHNOLOGY WOULD BE USED TO DETECT DNA DAMAGE, CYTOKINETIC ABNORMALITIES, AND ANEUPLOIDY. GENOTOXICITY AND CYTOKINETIC ABNORMALITIES WOULD BE ASSESSED IN VITRO BY LABELING WITH A HALOGENERATED PHRIMIDINE (IdUrd) AND THEN USING MULTIPARAMETER FLOW CYTOMETRIC ANALYSIS OF DNA CONTENT AND THE AMOUNT OF IdUrd INCORPORATED (DNA REPLICATION PATTERN) VIA A FLUORESCENT TAGGED MONOCLONAL ANTIBODY HIGHLY SPECIFIC FOR IdUrd. WE PROPOSE TO DEVELOP: 1) AN IMMUNOTOXICITY TEST BASED ON SHORT-TERM CULTURE, BLASTOGENEIC RESPONSE TO PHA MITOGEN STIMULATED, PERIPHERAL BLOOD LYMPHOCYTES (ULTIMATELY T-& B-CELL SUBSETS); AND 2) A HEPATOTOXICITY TEST USING IN VITRO IdUrd LABELING OF FINE NEEDLE ASPIRATION BIOPSIES. PHASE I STUDIES WOULD UTILIZE DOMESTIC CANINES, WHEREAS BOTH CANINE AND HUMAN CLINICAL MATERIAL WOULD BE STUDIED IN PHASE II. THE HIGH TECHNOLOGY TEST(S) TO BE DEVELOPED WOULD BE VERSATILE; HAVE BROAD COMMERCIAL AND MILITARY APPLICATIONS; AND REPRESENT A MAJOR STEP FORWARD ANALYTICALLY FOR TOXICITY TEST DETECTION OF DNA DAMAGE, CELLULAR ABNORMALITIES, AND DISEASES ACQUIRED NATURALLY OR BY EXPOSURE TO BIOLOGICAL WEAPONS.

CYTO FLUIDICS INC	ARMY	\$ 47,200
ENG RSCH CTR - BLDG 334 UNIV OF MARYLAND		
COLLEGE PARK, MD 20742		
JAMES F BROWN		
TITLE:		
A MULTICOLONY AUTOMATED CELL SYSTEM FOR GROWING HYBRIDOMAS		
DEVELOPMENT		
T 220	OFFICE: AMRDC/SGRD	

THIS PROPOSAL INVOLVES THE DESIGN, DEVELOPMENT, AND EVALUATION OF A MULTI-CHAMBER, LABORATORY-SCALE, SEMI-CONTINUOUS CELL CULTURE SYSTEM FOR MORE EFFICIENT, COST EFFECTIVE PRODUCTION OF MONOCLONAL ANTIBODIES (Mab). CONCEPTS WOULD BE INVESTIGATED WHICH WOULD ALLOW MODULAR CELL CHAMBERS TO BE FABRICATED FOR THE SIMULTANEOUS, ISOLATED GROWTH OF MULTIPLE ANIMAL CELL CULTURES UNDER INDEPENDENTLY CONTROLLED CONDITIONS. A CELL GROWTH MODULE AND PROPRIETARY MEMBRANE VALVE WOULD BE EVALUATED WITH ANIMAL CELLS IN PHASE I. IN PHASE II A FULLY-AUTOMATED 50 CHAMBER CELL CULTURE SYSTEM WOULD BE PROTOTYPE. THIS INSTRUMENT WOULD THEN BE MANUFACTURED AND MARKETING DURING PHASE III. OUR INSTRUMENT WOULD FACILITATE BIOLOGICAL RESEARCH EMPLOYING CELL CULTURE BY IMPROVING CELL VIABILITY, ENHANCING EXPERIMENTAL CON-

FISCAL YEAR 1986

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TROL AND FLEXIBILITY, AND REDUCING THE PROBABILITY OF CULTURE CONTAMINATION. THESE FEATURES AND THE CAPABILITY OF MAINTAINING MANY INDIVIDUALLY CONTROLLED CELL COLONIES WOULD ENHANCE THE PRODUCTION OF HYBRIDOMAS FOR MONOCLONAL PRODUCTION.

D.V. INC

AF

\$ 48,668

1734 W ORCHID LN

PHOENIX, AZ 85021

VALDER D BALDWIN

TITLE:

LONG TERM STORAGE EFFECTS ON FUZES EVALUATION

T 20

OFFICE: AFATL/DLG

STEP BY STEP PROCEDURES WILL BE DEVELOPED WHICH PROVIDE FOR THE DETAILED EVALUATION OF ELECTRONIC, MECHANICAL AND PYROTECHNIC DEVICES WITH RESPECT TO THE EFFECTS OF LONG TERM STORAGE. THESE PROCEDURES WILL PROVIDE FOR THEORETICAL (PAPER) EVALUATIONS OF THESE ELEMENTS, AS WELL AS STORAGE CONTAINERS, SPECIFICATIONS, AND PRODUCTION PROCEDURES, WHICH MAY LEAD TO ADDITIONAL PHYSICAL EVALUATIONS AND TESTS. BECAUSE OF THE WIDE VARIETY OF FUZE TYPES, THESE PROCEDURES WILL PROVIDE OUTLINES FOR THE PREPARATION OF PHYSICAL EVALUATIONS AND TEST PROCEDURES. PROBLEMS ISOLATED BY THIS METHODOLOGY WILL PROVIDE THE BASIS FOR RECOMMENDING CORRECTIVE ACTION. WHEN REQUIRED, VERIFICATION TESTS, SUCH AS THERMAL SHOCK, ACCELERATED LIFE AND PRESSURE COOKER TESTS, WILL BE PERFORMED DURING PHASE II.

DAMASKOS INC

ARMY

\$ 49,891

PO BOX 469

CONCORDVILLE, PA 19331

GREGORY B SENFT

TITLE:

THIN FILM MATERIAL HAVING ADJUSTABLE EMISSIVITY IN THE INFRARED AND TRANSPARENCY AT MICROWAVE FREQUENCIES

T 96

OFFICE: BRDC

DAMASKOS, INC. PROPOSES TO DEVELOP A THIN FILM MATERIAL WHICH CAN BE ECONOMICALLY MANUFACTURED IN LARGE SHEETS. THIS MATERIAL WILL HAVE INFRARED OPTICAL CHARACTERISTICS THAT CAN BE VARIED OVER A WIDE RANGE. THE MATERIAL WILL ALSO BE COMPATIBLE WITH RADAR LOW

FISCAL YEAR 1986

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OBSERVABLES TECHNOLOGIES (LOT), THAT IS TO SAY THAT THE MATERIAL  
WILL BE TRANSPARENT TO MICROWAVES.

DEACON RESEARCH 900 WELCH RD., SUITE 203 PALO ALTO, CA 94304 DAVID A G DEACON TITLE: UV DAMAGE TO OPTICAL MATERIALS T 1 OFFICE:	SDIO	\$ 85,398
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WE PROPOSE TO INVESTIGATE THE MECHANISM OF UV PHOTO-INDUCED DAMAGED IN OPTICAL MATERIALS. THIS OBJECTIVE REQUIRES THE USE OF A TUNABLE UV UNDULATOR SOURCE WHICH HAS SUFFICIENTLY HIGH FLUX TO EXPOSE SAMPLE OPTICS, AND APPROPRIATE SURFACE DIAGNOSTICS TO IDENTIFY THE ELECTRONIC PROCESSES AND STRUCTURAL CHANGES WHICH ACCOMPANY THE INCREASED ABSORPTION. IN PHASE I OF THIS EFFORT, WE WOULD DESIGN THE MODIFICATIONS REQUIRED FOR A SAMPLE INTRODUCTION AND IN SITU ABSORPTION MEASUREMENT APPARATUS WHICH WOULD BE MOVED FROM THE ORSAY UNDULATOR NOEL TO THE WUNDER MACHINE AT SSRL, AND DESIGN THE SURFACE DIANOSTICS TO BE ADDED TO THE APPARATUS. IN PHASE II, WE WOULD INSTALL THESE MODIFICATIONS AND CARRY FORWARD AN EXPERIMENTAL PROGRAM TO IDENTIFY THE UV DAMAGE MECHANISM; MEASURE ITS SCALING CHARACTERISTICS WITH PARTIAL PRESSURE, UV INTENSITY, AND SAMPLE TEMPERATURE; AND INVESTIGATE COUNTERMEASURES.

DECEL INC 1665 LEXINGTON AVE - STE 106 DELAND, FL 32724 JOHN B SHERMAN TITLE: LIGHTWEIGHT LOW CYCLE ENVIRONMENTALLY SEALED AIR CREW SURVIVAL EQUIPMENT STUDY T 86 OFFICE: NAVAIR	NAVY	\$ 48,750
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THE REQUIREMENTS OF THE MODERN NAVY ARE LIGHTER, FASTER, STRONGER. SOME OF THE PARACHUTES FOR AIR CREW SAFETY ARE OF A 1956 VINTAGE. THE WEIGHT OF THESE ASSEMBLIES IS EXCESSIVE WHEN COMPARED TO THE STATE OF THE ART TECHNOLOGY, COSTING THE NAVY IN EXCESS FUEL AND LOST MISSION CAPABILITY AS WELL AS EXCESSIVE MANPOWER DURING REQUIRED MAINTENANCE CYCLES. THIS STUDY ATTEMPTS TO PROVIDE THE CRITERIA AND



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
TECHNIQUES NECESSARY TO UPGRADE THIS INVENTORY TO A LEVEL THAT WILL ENDURE FOR THE NEXT 30 YEARS.		
DECISION SCIENCE CONSORTIUM INC 7700 LEESBURG PIKE - STE 421 FALLS CHURCH, VA 22043 DR MARVIN S COHEN TITLE: DISPLAY TECHNIQUES FOR PILOT INTERACTIONS WITH INTELLIGENT AVIONICS T 106 OFFICE: AFWAL/AA	AF	\$ 74,154

THE SUCCESSFUL INTRODUCTION OF AI TECHNOLOGY INTO AIR FORCE AVIONICS HAS BEEN HINDERED BY THE NEED FOR HUMAN-COMPUTER INTERFACES WHICH REPRESENT INFORMATION IN WAYS THAT ARE COMPATIBLE WITH THE PILOT'S PREFERRED MEANS OF REPRESENTING INFORMATION AND MAKING DECISIONS. DSC'S HYPOTHESIS IS THAT RECENT RESEARCH IN THE FIELDS OF MENTAL MODELS, HUMAN DECISION BEHAVIOR, AND DECISION AID DESIGN CAN SHED LIGHT ON HOW ADAPTIVE DISPLAYS OF THE REQUIRED KIND MIGHT BE DEVELOPED. RESEARCH ON MENTAL MODELS HAS IDENTIFIED NOT ONLY PHYSICAL (E.G., SPATIAL OR TEMPORAL) MODELS USED BY HUMANS TO REPRESENT KNOWLEDGE, BUT ALSO CONCEPTUAL MODELS PORTRAYING ABSTRACT RELATIONSHIPS LIKE UNCERTAINTY OR DEGREE OF TRUTH. RESEARCH ON DECISION MAKING HAS IDENTIFIED SOURCES OF HUMAN ERROR OR BIAS INHERENT IN THE UNAIDED USE OF NATURAL HUMAN KNOWLEDGE STRUCTURES. FINALLY, RESEARCH ON DECISION AIDING HAS RECENTLY SHOWN HOW DECISION-AIDING SYSTEMS CAN BE BOTH PERSONALIZED, CATERING TO AN INDIVIDUAL'S PERSONAL COGNITIVE STYLE, AND PRESCRIPTIVE, I.E., PROTECTING USERS FROM ERRORS TO WHICH THEIR PREFERRED METHODS OF KNOWLEDGE REPRESENTATION AND PROBLEM SOLVING MIGHT LEAD. THREE TASKS ARE PROPOSED: (1) EXAMINATION OF RELEVANT CONCEPTS FROM THE ABOVE FIELD; (2) DEVELOPMENT OF INTERACTIVE PILOT DISPLAY DESIGN CONCEPTS; AND (3) IMPLEMENTATION AND PRELIMINARY TESTING OF THOSE CONCEPTS IN A SMALL-SCALE SYSTEM.

DECISION SCIENCE CONSORTIUM INC 7700 LEESBURG PIKE - STE 421 FALLS CHURCH, VA 22043 MARVIN S COHEN TITLE: EVIDENTIAL REASONING ALGORITHMS FOR SHIPBOARD DECISION AIDS T 53 OFFICE: NAVSEA	NAVY	\$ 74,886
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THE SUCCESSFUL INTRODUCTION OF AI TECHNOLOGY INTO SHIPBOARD DECISION

FISCAL YEAR 1986

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MAKING HAS BEEN HINDERED BY THE NEED FOR REAL-TIME REASONING WITH INCOMPLETE AND INCONSISTENT DATA, RESOLUTION OF CONFLICTS BETWEEN CONFLICTING OBJECTIVES, INTEGRATION OF HIGH LEVEL SUBSYSTEMS WITH SYSTEMS FOR SIGNAL ANALYSIS, AND AN ADAPTIVE HUMAN-COMPUTER INTERFACE. DSC PROPOSES TO TEST THE HYPOTHESIS THAT SOLUTIONS FOR THESE PROBLEMS ARE LINKED, AND THAT IMPROVED ARCHITECTURES CAN BE DEVELOPED BY INCORPORATING FEATURES FROM BELIEF FUNCTIONS, THEORY FUZZY LOGIC, RECENT WORK IN BAYESIAN PROBABILITY, AND NON-NUMERICAL APPROACHES TO REASONING SUCH AS THE THEORY OF ENDORSEMENTS AND NON-MONOTONIC LOGIC. THE PRIMARY OBJECTIVE OF PHASE I RESEARCH IS TO EXPLORE THE FEASIBILITY OF DEVELOPING NEW METHODS FOR INFERENCE IN SHIPBOARD EXPERT SYSTEMS, WHICH ADDRESS SPECIFIC SHORTCOMINGS IN EXISTING APPROACHES AND COMBINE SOME OF THEIR DISTINCT VIRTUES. THE SECOND OBJECTIVE OF PHASE I RESEARCH IS TO IMPROVE UNDERSTANDING OF THE CHARACTERISTICS OF SHIPBOARD APPLICATION DOMAINS THAT MAKE ONE INFERENCE SCHEME MORE APPROPRIATE THAN ANOTHER. FOUR TASKS HAVE BEEN PROPOSED: (1) A SYSTEMATIC EXAMINATION OF ALTERNATIVE EVIDENTIAL REASONING MECHANISMS; (2) EXAMINATION OF SHIPBOARD DECISION TASKS IN TERMS OF FACTORS RELEVANT TO EVIDENTIAL REASONING TECHNIQUES; (3) DEVELOPMENT OF IMPROVED SHIPBOARD EVIDENTIAL REASONING METHODS; (4) IMPLEMENTATION OF A SMALL-SCALE PROTOTYPE SYSTEM IN AN OPERATIONAL CONTEXT AND TESTING.

DECISION SCIENCE CONSORTIUM INC  
7700 LEESBURG PIKE - STE 421  
FALLS CHURCH, VA 22043  
JACOB W ULVILA

ARMY

\$ 65,617

## TITLE:

SPECIFYING TESTING AND EVALUATING C3I SYSTEMS THAT EMPLOY  
ARTIFICIAL INTELLIGENCE

T 161 OFFICE: TECOM/EPG

THE OBJECTIVE OF THIS PROPOSED RESEARCH IS TO DEVELOP NEW METHODS OF TESTING AND EVALUATION THAT ARE APPROPRIATE FOR C3I SYSTEMS THAT EMPLOY ARTIFICIAL INTELLIGENCE (AI). THE APPROACH WILL BE TO DEVELOP A MULTIATTRIBUTE UTILITY (MAU) ANALYSIS OF PERFORMANCE THAT FULLY AND MEANINGFULLY CHARACTERIZES THE PERFORMANCE OF THE SYSTEM AND LINKS THIS CHARACTERIZATION TO OBJECTIVE, TESTABLE MEASURES. PHASE I WILL INVOLVE FOUR TASKS. IN TASK 1, WE WILL REVIEW CURRENT AND LIKELY FUTURE APPLICATIONS OF AI IN MILITARY C3I SYSTEMS, AND CHARACTERIZE THOSE APPLICATIONS IN A MANNER THAT WILL FACILITATE

FISCAL YEAR 1986

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THE DEVELOPMENT OF TEST AND EVALUATION MEASURES, AND SPECIFY AN MAU ANALYSIS. THE MAU ANALYSIS WILL INCLUDE A HIERARCHY OF ATTRIBUTES, VALUE SCALES, AND TRADEOFF WEIGHTS. IN TASK 3, WE WILL DESIGN A TEST AND EVALUATION FOR ONE SELECTED SYSTEM. IN TASK 4, WE WILL INVESTIGATE THE FEASIBILITY OF GENERALIZING THE APPROACH AND DEVELOPING A HANDBOOK OR COMPUTERIZED DECISION AID. IN PHASE 2, WE WILL CONDUCT TESTS AND DEVELOP A HANDBOOK OR COMPUTERIZED AID.

DECISION SCIENCE CONSORTIUM INC 7700 LEESBURG PIKE - STE 421 FALLS CHURCH, VA 22043 DR MARVIN S COHEN TITLE: ARTIFICIAL INTELLIGENCE FOR COMMAND AND CONTROL T 50 OFFICE: CECOM/AMSEL	ARMY	\$ 57,997
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THE MODERN BATTLEFIELD CALLS FOR HIGH-STAKES DECISIONS AND JUDGMENTS IN AN INCREASINGLY COMPLEX ENVIRONMENT CHARACTERIZED BY HIGH VOLUMES OF UNCERTAIN, INCOMPLETE, AND OFTEN INCONSISTENT INFORMATION. IN THE FUTURE, INTELLIGENT COMPUTERIZED SYSTEMS CAPABLE OF ADAPTIVE LEARNING WILL BECOME NECESSARY AS AIDS TO HUMAN DECISION MAKERS. DSC HYPOTHEZES THAT SIGNIFICANT ADVANCES IN THE CAPABILITY FOR TRUE ADAPTIVE LEARNING CAN BE ACHIEVED BY COMBINING A GOAL-BASED, HIERARCHIAL KNOWLEDGE REPRESENTATION WITH A STATE-OF-THE-ART CAPABILITY FOR REPRESENTING AND MANIPULATING UNCERTAINTY. THIS COMBINATION WILL MAKE POSSIBLE A SYNERGISTIC LEAP IN THE FLEXIBILITY AND ADAPTABILITY OF INTELLIGENT BATTLEFIELD EXPERT SYSTEMS. FOUR TASKS ARE PROPOSED FOR PHASE I: (1) DEVELOP A THEORY OF HIERARCHICAL, GOAL-STRUCTURED KNOWLEDGE REPRESENTATION; (2) DEVELOP THEORIES FOR REPRESENTING AND MANIPULATING UNCERTAINTY; (3) SYNTHESIZE THEORIES OF KNOWLEDGE REPRESENTATION AND UNCERTAINTY INTO DESIGNS FOR EXPERT SYSTEM ARCHITECTURE; AND (4) IMPLEMENT SELECTED IDEAS IN A SMALL-SCALE PROTOTYPE SYSTEM.

DECISION-SCIENCE APPLICATIONS INC 1901 N MOORE ST - STE 1000 ARLINGTON, VA 22209 DR ARTHUR J BRUCKHEIM TITLE: HIGH ALTITUDE SYNTHETIC APERTURE RADAR (SAR) FOR BALLISTIC MISSILE MISSIONS T 220 OFFICE: BMO/MYSC	AF	\$ 50,023
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SAR (SYNTHETIC APERTURE RADAR) IS A RADAR IMAGING TECHNIQUE THAT

FISCAL YEAR 1986

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PRODUCES HIGH RESOLUTION MAPS OF THE RADAR CROSS SECTION OF A SCENE BY PROCESSING THE COHERENT PHASE HISTORY OF THE RETURN SIGNAL OVER MULTIPLE PULSES. SAR SYNTHESIZES AN ANTENNA THE LENGTH OF WHICH IS TWICE THE DISTANCE THE SAR PLATFORM FLIES DURING ONE COHERENT DWELL; SINCE THE AZIMUTH RESOLUTION IS INVERSELY PROPORTIONAL TO ANTENNA LENGTH, SAR ACHIEVES MUCH SMALLER AZIMUTH RESOLUTION THAN CONVENTIONAL RADAR PROCESSING. SAR CAN PROVIDE DATA FOR TARGETING BEFORE LAUNCH OR FOR INFILIGHT UPDATES. BETTER TARGET DATA WOULD RESULT IN BETTER BALLISTIC MISSILE POINTING AND ACCURACY. SAR DATA FOR TERMINAL POSITION FIXING CAN INCREASE MISSILE ACCURACY BY PROVIDING THE GUIDANCE COMPUTER WITH A HIGH-RESOLUTION MAP OF THE GROUND.

DECISION-SCIENCE APPLICATIONS INC

AF

\$ 50,180

1901 N MOORE ST - STE 1000

ARLINGTON, VA 22209

PHILIP G TOMLINSON

TITLE:

CONFORMAL ARRAY MODELING AND SIMULATION

T 259

OFFICE: BMO/MYSC

THE NEED FOR LARGE HIGH-PERFORMANCE ARRAYS ON NONPLANAR SURFACES, COUPLED WITH RECENT ADVANCES IN ELECTRONICS TECHNOLOGY, HAS RESULTED IN A RECENT SURGE OF INTEREST IN CONFORMAL ARRAYS. APPLICATIONS INCLUDE LARGE CONFORMAL ARRAYS ON AIRCRAFT FUSELAGE FOR SURVEILLANCE, ON ARTILLERY SHELLS, FOR MISSILE SEEKERS (AIR-TO-AIR, SURFACE-TO-AIR, AND AIR-TO-SURFACE APPLICATIONS) AND ON REENTRY VEHICLES. CONFORMAL ARRAYS HAVE PROVEN TO BE ATTRACTIVE ALTERNATIVES TO MOUNTING EXTERNAL RADOMES ON, CUTTING HOLES IN OR CHANGING THE SHAPES OF VEHICLES TO ACCOMMODATE AN ANTENNA. THESE ARRAYS ARE ESPECIALLY ATTRACTIVE FOR APPLICATIONS WHICH REQUIRE WIDE ANGULAR COVERAGE WHILE MINIMIZING SCAN LOSS. HOWEVER, NON-PLANAR ARRAYS HAVE SOME UNIQUE FEATURES WHICH MUST BE RECOGNIZED. NOT THE LEAST OF THESE IS THAT CONFORMAL ARRAYS ARE MORE DIFFICULT TO DESIGN AND TO ANALYZE THAN ARE PLANAR ARRAYS. FURTHERMORE, COMPLEXITY IS ADDED WHEN SURFACE IS CONICAL, AS ON A REENTRY VEHICLE. THE TECHNICAL OBJECTIVES OF THE PROPOSED RESEARCH ARE TO FORMULATE AND VERIFY EXPRESSIONS FOR CHARACTERIZING THE RESPONSE OF CONICALLY CONFORMAL ARRAYS. TO DO THIS, DSA WILL MAKE USE OF EXISTING INNOVATIVE COMPUTER MODELS AND MATHEMATICAL TECHNIQUES. THE INTENDED RESULT IS TO ADD TO THE UNDERSTANDING OF CONFORMAL ARRAY PERFORMANCE AND TO DEVELOP TOOLS AND A DATA BASE FOR FUTURE ANALYSES.

FISCAL YEAR 1986

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DEEGAN RESEARCH GP INC 728 BRISTOL FERRY RD PORTSMOUTH, RI 02871 T DEEGAN TITLE: COMPOSITE MODULAR STRUCTURE TO HOUSE ELECTRONICS IN SUBMARINES T 50 OFFICE: NAVSEA	NAVY	\$ 49,162

THIS STUDY INVESTIGATES THE FEASIBILITY AND SUITABILITY OF APPLYING A COMPOSITE STRUCTURE TO ENCLOSE ELECTRONIC EQUIPMENT IN SUBMARINES. THE PROPERTIES OF THE STRUCTURE THAT ARE INVESTIGATED IN GREATEST DETAIL ARE WEIGHT AND VOLUMETRIC EFFICIENCY. SECONDARY INFLUENCES CONSIDERED AND QUANTIFIED ARE SHIP CONSTRUCTION EFFORT, TIME TO TEST ELECTRONICS, PERFORMANCE UNDER SHOCK LOADING AND CHARACTERISTICS OF VIBRATION DAMPING AND NOISE TRANSMISSION. THE METHOD USED TO QUANTIFY THE BENEFITS OF THE SUBJECT STRUCTURE, IN TERMS RELEVANT TO THE SUBMARINE CONSTRUCTION PROCESS, IS BY COMPARISON WITH EXISTING STRUCTURES, CURRENTLY USED TECHNIQUES, AND KNOWN CONSTRUCTION TIME-TABLES. THE COMBAT SYSTEM EQUIPMENT SPACE OF AN EXISTING ATTACH SUBMARINE IS USED AS A MODEL. THE SIZE, SHAPE, EQUIPMENT ENCLOSED, CABINETS, WIREWAY, DECK STRUCTURE, AND HULL ATTACHMENTS ARE THE GIVEN QUANTITIES FOR THE STUDY. A COMPOSITE STRUCTURE IS DESIGNED TO ACCOMMODATE THE SAME EQUIPMENT AND THE DIFFERENCES, ADVANTAGES, AND DISADVANTAGES ARE ENUMERATED.

DEFENSE ELECTROMAGNETIC ANALYSIS CO 5 MORaine CT CHAMPAIGN, IL 61821 S W LEE TITLE: DEPOLARIZATION EFFECT OF RADOMES T 105 OFFICE: MICOM	ARMY	\$ 40,075
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THE PROJECT IS TO DEVELOP A STATE-OF-THE-ART ANALYSIS AND COMPUTER CODE FOR THE DEPOLARIZATION EFFECT OF A RADOME. WE HAVE AN INNOVATIVE COMPUTATIONAL SCHEME IN PERFORMING THE PHYSICAL-OPTICS INTEGRATION OVER THE DOUBLY CURVED RADOME SURFACE THAT IS FAR SUPERIOR TO CONVENTIONAL METHODS. FURTHERMORE, WE HAVE ALREADY DONE SUBSTANTIAL PRELIMINARY WORK, AND ARE IN A POSITION TO DELIVER

FISCAL YEAR 1986

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COMPUTER CODES TO OUR SPONSOR WITHIN 5 MONTHS.

DEL MAR AVIONICS

ARMY

\$ 49,451

1601 ALTON AVE

IRVINE, CA 92714

SEAN AMOUR

TITLE:

MANPRINT MOBILE PHYSIOLOGICAL MONITORING SYSTEM

T 162

OFFICE: TECOM/CRTC

DEL MAR AVIONICS PROPOSES TO DEVELOP A MOBILE PHYSIOLOGICAL MONITORING SYSTEM FOR THE U.S. ARMY'S MANPRINT PROGRAM WITH SPECIFIC APPLICATION TO THE COLD REGION TESTING REQUIREMENTS. THIS PHASE I STUDY IS INTENDED TO (1) IDENTIFY DETAILED REQUIREMENTS AND GENERATE PRELIMINARY SPECIFICATIONS FOR THE SYSTEM; (2) APPLY THE LATEST TECHNOLOGIES AVAILABLE IN BIOMEDICAL, HUMAN FACTORS AND ELECTRONICS ENGINEERING TO RECOMMEND AN OPTIMUM DESIGN FOR PHASE II. THE STUDY WILL RESULT IN (1) IDENTIFICATION OF PHYSIOLOGICAL PARAMETERS THAT VARY UNDER SPECIFIC TASKS/ACTIVITIES; (2) FUNCTIONAL DESIGN INCLUDING SPECIFIC DATA ACQUISITION SENSORS AND MEANS OF COMMUNICATION BETWEEN THE SOLDIER(S) AND A REMOTE MONITORING STATION; (3) IDENTIFICATION OF TECHNIQUES AND EQUIPMENT RESOURCES AVAILABLE FROM THE INDUSTRY CAPABLE OF SATISFYING DESIGN REQUIREMENTS; AND (4) DESCRIPTION OF A RECOMMENDED SYSTEM CONFIGURATION AND SOFTWARE/HARDWARE CAPABILITIES.

DELPHI RESEARCH INC

AF

\$ 57,154

701 HAINES AVE NW

ALBUQUERQUE, NM 87102

PATRICK M DHOOGHE

TITLE:

SOLID ELECTROLYTE FOR ELECTROCHEMICAL POWER SOURCES IMPROVEMENT

T 173

OFFICE: AFWAL/PO

A STUDY IS PROPOSED TO DETERMINE THE FEASIBILITY OF UTILIZING A LOW MOLECULAR WEIGHT ORGANIC GLASS AS A SOLID ELECTROLYTE IN LITHIUM BATTERIES. SELECTED ORGANIC AMINE COMPOUNDS WILL BE SCREENED FOR ABILITY TO FORM STABLE GLASSES AT ROOM TEMPERATURE. SUCCESSFUL GLASS-FORMERS WILL BE TESTED FOR ABILITY TO SOLUBILIZE SODIUM METAL AND FOR GLASS TRANSITION TEMPERATURE. ATTEMPTS WILL BE MADE TO PRE-

FISCAL YEAR 1986

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PARE SOLID SOLUTIONS OF SODIUM IN ORGANIC AND TEST THEM FOR CONDUCTIVITY AND STABILITY.

DESCRIPT CO

ARMY

\$ 45,820

7328 O'ROURKE LN - LR RANCH

EL PASO, TX 79934

SCOTT P PEARSON

TITLE:

MALCH

T 95

OFFICE: LABCOM/VAL

MALCH IS A NEW PASSIVE TECHNOLOGY THAT HOLDS THE PROMISE OF ALLOWING CONTROLLABILITY OF THE MAJOR PARAMETERS OF PASSIVE SCATTERS WHETHER DEPLOYED SINGLY AS DECOYS OR IN LARGE CLOUDS AS CHAFF. THE CONTROLLABLE DYNAMIC AND ELECTROMAGNETIC PARAMETERS INCLUDE DENSITY OF SCATTERS, SCINTILLATION PROPERTIES INCLUDING POLARIZATION, FALL RATE, CLOUD GROWTH RATE, CENTROID MOTION AND DOPPLER BANDWIDTH.

DESIGN CIRCUITS INC

NAVY

\$ 51,160

15 KENDRICK DR

WAREHAM, MA 02571

JEFFREY S RUSSELL

TITLE:

DIRECT ATTACHMENT OF INTEGRATED CIRCUITS TO PRINTED CIRCUIT BOARDS

T 149

OFFICE: NWSC

A MEANS TOWARDS THE ABILITY OF DIRECTLY ATTACHING INTEGRATED CIRCUITS TO PRINTED CIRCUIT BOARDS IS PROPOSED. STUDIES OF THE TECHNIQUES USED WITHIN THE INDUSTRY TO FABRICATE INTEGRATED CIRCUITS ARE PERFORMED. THE TECHNOLOGY IS ADAPTED TO PERMIT THE CHIPS TO BE ATTACHED TO PRINTED CIRCUIT SUBSTRATES WITH THERMAL AND ELECTRICAL PROPERTIES THAT WILL PERMIT CHIP SURVIVAL. WITH THE COOPERATION OF WIRE BONDING AND LAMINATE FABRICATION HOUSES, A SMALL NUMBER OF ACTUAL CIRCUITS ARE TO BE FABRICATED TO DEMONSTRATE FEASIBILITY.

DESIGNERS &amp; PLANNERS INC

ARMY

\$ 44,904

2011 CRYSTAL DR

ARLINGTON, VA 22202

DR P Y CHANG

TITLE:

STABILIZATION OF THE SHIP/LIGHTER INTERFACE (STABILIZATION OF THE LOTS SITE/SEA STATE INTERFACE)

T 103

OFFICE: BRDC

THE ARMY LOGISTICS OVER THE SHORE (LOTS) MISSION IS TO LOGISTICALLY

FISCAL YEAR 1986

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SUPPORT MILITARY OPERATIONS ASHORE, BY SEABORNE MEANS. THE LATTER WILL INCLUDE THE USE OF SITES ESTABLISHED AS CLOSE TO AREAS OF MILITARY OPERATIONS AS PRACTICABLE, WHEREIN OCEAN GOING SHIPS WILL BE OFFLOADED INTO AIR CUSHION VEHICLES, LANDING CRAFT, AND LIGHTERS FOR CONVEYANCE OF CARGOES TO CAUSEWAYS AND, OR DIRECTLY TO THE SHORE. SITES WILL BE EXPOSED TO THE EFFECTS OF THE NATURAL ENVIRONMENT WHICH COULD INCLUDE SIGNIFICANT SEA STATE CONDITIONS, RESULTING IN HEAVY WAVE ACTION AND SURF ZONES IN THE SITES. SUCH CONDITIONS COULD IMPAIR PERFORMING THE MISSION, BECAUSE OF APPRECIABLE RELATIVE MOTIONS AT THE SHIP/LIGHTER INTERFACE, AND HAZARDOUS TRANSIT CONDITIONS FOR NON AIR CUSHION LANDING CRAFT AND LIGHTERS. THE OBJECTIVE OF THIS PROPOSAL IS THE DEVELOPMENT OF AN ARTIFICIAL MEANS FOR PROTECTING THE SITES AND THEREBY STABILIZING THE LOTS SITE SEA STATE INTERFACE. IT IS CONSIDERED THAT UNLESS THE LATTER INTERFACE IS STABILIZED, OR REDUCED IN MAGNITUDE, RELATIVE MOTIONS AT THE SHIP/LIGHTER INTERFACE COULD BE EXCESSIVE, AND THE OPERATION OF LANDING CRAFT AND LIGHTERS WILL BE EITHER DANGEROUS OR IMPRACTICAL IN HIGHER SEA STATES. THE EFFORT PROPOSED INCLUDES ANALYSES, DESIGN, MODEL, AND HALF/FULL SCALE TESTS.

DIAGNOSTIC SPECIALTIES INC  
PO BOX 4338 - 212 DURHAM AVE  
METUCHEN, NJ 08840  
DR RINALDO PAGNUCCO

ARMY

\$ 56,056

## TITLE:

A NOVEL ROUTINE ASSAY FOR AIDS VIRUS AND OTHER PATHOGENIC VIRUSES  
T 210 OFFICE: AMRDC/SGRD

IT IS IMPORTANT TO BE ABLE TO SCREEN BLOOD SAMPLES FOR THE PRESENCE OF PATHOGENIC VIRUSES SUCH AS HTLV-III, THE CAUSITIVE AGENT IN ACQUIRED IMMUNE DEFICIENCY SYNDROME (AIDS). THIS PROPOSAL DETAILS A NOVEL APPROACH FOR THE IDENTIFICATION AND QUANTITATION OF SPECIFIC NUCLEIC ACID SEQUENCES. IT USES FLUORESCENT, RATHER THAN RADIO-ACTIVE OR ENZYME-LINKED OLIGODEOXYNUCLEOTIDE PROBES. IT IS A HOMOGENEOUS ASSAY AND DOES NOT REQUIRE ANY SEPARATION STEPS, SUCH AS FILTRATION OR ELECTROPHORESIS. IT IS DESIGNED TO BE ACCURATE, SPECIFIC, SENSITIVE, INEXPENSIVE, RAPID AND EASY TO PERFORM. THESE ATTRIBUTES WOULD ALLOW THIS ASSAY TO BE APPLIED TO THE SCREENING OF BLOOD SAMPLES FOR KNOWN PATHOGENIC VIRUSES. THIS PHASE I STUDY WILL DEMONSTRATE THE FEASIBILITY OF THE DESCRIBED APPROACH USING A SYNTHETIC OLIGODEOXYNUCLEOTIDE TARGET AS A MODEL OF THE VIRAL GENOME.



FISCAL YEAR 1986

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DIALOG SYSTEMS INC 2842 E GRAND RIVER EAST LANSING, MI 48823 DR OMAR KEITH HELFERICH TITLE: RULE BASE EXPERT SYSTEM FOR RETAIL INVENTORY ITEM MANAGEMENT T 78 OFFICE: NAVSUP	NAVY	\$ 46,350

THE FEASIBILITY OF THE PROPOSED EXPERT SYSTEM WILL BE PROVEN THROUGH ACHIEVEMENT OF THREE GOALS IN PHASE I. THESE GOALS ARE: 1) DEVELOPMENT OF A CONCEPTUAL DESIGN, 2) DEFINITION OF COST/BENEFITS, AND 3) DEVELOPMENT AND EVALUATION OF A PROTOTYPE EXPERT SYSTEM ON A PERSONAL COMPUTER. THE OUTPUTS OF PHASE I WILL BE A WRITTEN REPORT AND A WORKING COPY OF THE PROTOTYPE. THE PROPOSED EXPERT SYSTEM WOULD IMPROVE ITEM INVENTORY PERFORMANCE THROUGH INCREASED INVENTORY TURN-OVER, LOWER AVERAGE INVENTORY AND HIGHER SERVICE. THE EXPERT SYSTEM WOULD INCREASE UTILIZATION OF THE CURRENT SYSTEM AND DATA, AND REDUCE LABOR REQUIRED TO PROCESS EXCEPTIONS. THE PROPOSED EXPERT SYSTEM WOULD INCLUDE THREE MODULES: 1) A STAND ALONE MODULE TO ASSIST IN TRAINING OF ITEM MANAGERS, 2) AN ON-LINE MODULE TO IMPROVE ITEM CONTROL, AND 3) AN OFF-LINE MODULE TO PROVIDE PERFORMANCE ASSESSMENT AND PRESCRIPTIONS FOR IMPROVEMENT. THE PHASE I OBJECTIVES WILL BE ACHIEVED THROUGH A SIX STEP WORKPLAN AS FOLLOWS: 1) DOMAIN PROBLEM/FAMILIARIZATION, 2) DOMAIN ANALYSIS, 3) EXPERT SYSTEM WORKSHOP AND TASK SELECTION, 4) EXPERT SELECTION, 5) PROTOTYPE DEVELOPMENT, AND 6) PROTOTYPE EVALUATION. THIS BASIC WORKPLAN HAS BEEN SUCCESSFULLY UTILIZED PREVIOUSLY BY DIALOG SYSTEMS ON SIMILAR DECISION SUPPORT SYSTEM DEVELOPMENT PROJECTS.

DIGITAL ANALYSIS CORP 1889 PRESTON WHITE DR RESTON, VA 22091 DR ELIZABETH A NICHOLS TITLE: HETEROGENEOUS DISTRIBUTED DATA BASE MANAGEMENT T 149 OFFICE: LABCOM/BRL	ARMY	\$ 49,818
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THE OBJECTIVE OF THIS PROJECT IS TO INVESTIGATE SEVERAL KEY IMPLEMENTATION ISSUES BY DESIGNING AND BUILDING UNIX-BASED PROTOTYPE HETERO-

FISCAL YEAR 1986

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GENEOUS QUERY PROCESSING SOFTWARE. THIS SOFTWARE WILL, PROVIDE UNIFORM ACCESS TO DATA THAT MAY BE RESIDENT IN MORE THAN ONE DATA BASE AND/OR AT MORE THAN ONE HOST. IT WILL INTERFACE TO PRE-ESTABLISH DATA BASES RUNNING UNDER EXISTING DBMS WITHOUT REQUIRING ANY MODIFICATION TO THE DBMS PRODUCT, TO THE DATA BEING ACCESSED, OR TO ANY PRO-EXISTING SINGLE HOST APPLICATION SOFTWARE. THE FIRST MAJOR ISSUE TO BE INVESTIGATED IS DISTRIBUTED DATA BASE ADMINISTRATION DESCRIPTIONS OF EACH PARTICIPATING DATA BASE, USER AUTHORIZATIONS, CROSS REFERENCES BETWEEN THE VIRTUAL INTEGRATE VIEWS AND PHYSICAL DATA BASE RECORDS/FIELDS, PLUS OTHER INFORMATION, WILL NEED TO BE MAINTAINED ON MULTIPLE HOSTS. ADMINISTRATION OF THIS NEEDS TO BE AS PAINLESS AS POSSIBLE. THE SECOND MAJOR ISSUE TO BE INVESTIGATED IS THE PERFORMANCE OF THE QUERY DECOMPOSITION PROCESS THAT BREAKS DOWN A QUERY AGAINST THE INTEGRATED VIRTUAL DATA VIEW TO A SET OF "SUB-QUERIES" AGAINST INDIVIDUAL PHYSICAL DATA BASES THAT COLLECTIVELY "ADD-UP" TO THE ORIGINAL.

DIGITAL DEVELOPMENT CORP 1015 33RD ST NW - STE 410 WASHINGTON, DC 20007 JEFFREY A BLOOM TITLE: RETAIL INVENTORY MANAGEMENT ADVISORY NETWORK DEVELOPMENT (RIMAND) T 78 OFFICE: NAVSUP	NAVY	\$ 46,999
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IN THE PHASE I OF THE RETAIL INVENTORY MANAGEMENT ADVISORY NETWORK DEVELOPMENT (RIMAND) EFFORT A LIMITED PROTOTYPE OF THE ADVISORY NETWORK WILL BE DEVELOPED. A SMALL AREA OF RETAIL INVENTORY MANAGEMENT RESPONSIBILITY WILL BE EXAMINED, AND THE ASSOCIATED POLICIES AND PROCEDURES WILL BE CODIFIED IN AN EXPERT SYSTEM IMPLEMENTED ON A PROGRAMMABLE WORKSTATION. A DEMONSTRATION OF THE NETWORK ACCESS FACILITIES WILL BE ATTEMPTED WITHIN THE LIMITATIONS OF THE CURRENT UICP, UADPS-SP AND SPLICE SYSTEMS.

DIGITAL OPTICS INC 620 UNIVERSITY DR ROCHESTER, MI 48063 RAYMOND ARRATHOON TITLE: RECONFIGURABLE OPTICAL SUPERCLASSIFIER T 13 OFFICE: DARPA	DARPA	\$ 97,160
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THE PRESENT PROGRAM HAS THREE TECHNICAL OBJECTIVES. THE FIRST IS TO

FISCAL YEAR 1986

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CONSTRUCT A COMPUTER CONTROLLED VERSION OF A CONFIGURABLE OPTICAL SUPERCLASSIFIER THAT IS CAPABLE OF ACCEPTING A SYSTOLIC STREAM OF INPUT DATA. THE NEXT MAJOR OBJECTIVE OF THIS PROPOSAL IS TO DEVELOP A DETAILED DESCRIPTION OF THE BUS STRUCTURE THAT WILL BE REQUIRED TO FEED DATA INTO THE OPTICAL SUPERCLASSIFIER AT RATES THAT ARE COMMENSURATE WITH THE PERFORMANCE OF THE OPTICAL MACHINE. THE FINAL OBJECTIVE IS TO DEVELOP THE ARCHITECTURE AND DETAILED HARDWARE DESCRIPTION OF AN ADAPTIVE THRESHOLD LOGIC CLASSIFIER THAT CAN RESPOND TO NEW PROBLEMS WITHOUT REQUIRING ANY EXTERNAL COMPUTATIONAL RESOURCES.

DIGITAL OPTICS, INC 620 UNIVERSITY DR ROCHESTER, MI 48063 RAYMOND ARRATHOON TITLE: OPTICAL ASSOCIATIVE SUPERPROCESSOR T 9 OFFICE:	SDIO	\$ 97,160
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THE PRESENT PROGRAM HAS THREE TECHNICAL OBJECTIVES. THE FIRST IS TO CONSTRUCT A COMPUTER CONTROLLED VERSION OF AN OPTICAL ASSOCIATIVE SUPERPROCESSOR THAT IS CAPABLE OF ACCEPTING A SYSTOLIC STREAM OF INPUT DATA. THE NEXT MAJOR OBJECTIVE OF THIS PROPOSAL IS TO DEVELOP A DETAILED DESCRIPTION OF THE BUS STRUCTURE THAT WILL BE REQUIRED TO FEED DATA INTO THE OPTICAL SUPERPROCESSOR AT RATES THAT ARE COMMENSURATE WITH THE PERFORMANCE OF THE OPTICAL MACHINE. THE FINAL OBJECTIVE IS DIVIDED INTO TWO PARTS. THE FIRST IS TO DEVELOP THE BASIC ARCHITECTURE AND DETAILED OPTICAL SPECIFICATIONS OF A NEAREST NEIGHBOR COMPUTATIONAL MACHINE. THE SECOND IS TO EXAMINE THE ABILITY OF THE OPTICAL SYSTEM TO PROVIDE RECONFIGURABLE GLOBAL INTERCONNECTS IN THE CONTEXT OF A REGION LEVEL COMPUTATIONAL MACHINE.

DIGITAL RADIO CORP 601 S PACIFIC COAST HWY REDONDO BEACH, CA 90277 OLIVER SAUNDERS TITLE: ADAPTIVE RF POWER AMPLIFIER FOR AN ADAPTIVE JAMMER T 55 OFFICE: CECOM/AMSEL	ARMY	\$ 52,561
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THIS PROPOSAL DESCRIBES THE START OF AN EFFORT TO DEVELOP AN ADAPTIVE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>JAMMER SYSTEM. THERE ARE SEVERAL TECHNICAL PROBLEMS TO SOLVE BEFORE THE ADAPTIVE JAMMER CAN BE DEVELOPED. ONE DIFFICULTY ENCOUNTERED WITH THE ADAPTIVE JAMMER SYSTEM CAN BE SOLVED BY DESIGNING THE EXCITER TO PROVIDE THE REQUIRED SIGNAL TO THE RF AMPLIFIER. HOWEVER, THE RF POWER AMPLIFIER PROBLEM HAS NOT BEEN SOLVED. THE EFFORT IN PHASE I WILL STUDY SEVERAL APPROACHES TO THE RF POWER AMPLIFIER PROBLEM, SELECT ONE FOR A CONCEPTUAL DESIGN, AND DEVELOP A SPECIFICATION FOR THE CONCEPTUAL DESIGN. THE SPECIFICATION IN THIS PHASE WILL BE THE BASIS FOR THE EFFORT IN PHASE II.</p>		

DIGITAL SIGNAL CORP 5554 PORT ROYAL RD - STE 208 SPRINGFIELD, VA 22151 DR JAMES GENOVA TITLE: NAVAL COUNTERMEASURE CONTROLLER T 36 OFFICE: SPAWAR	NAVY	\$ 49,775
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DURING AN ATTACK ON A NAVAL BATTLE GROUP, THERE WILL BE A CONSIDERABLE AMOUNT OF INFORMATION TO BE ABSORBED AND ACTED UPON BY THE EW OPERATOR IN A SHORT TIME AND UNDER STRESSFUL CONDITIONS. THE INFORMATION FROM MANY SENSORS MUST BE CORRELATED SUCH AS OWNERSHIP ESM DATA, MISSILE LIBRARY DATA, ECM ASSET STATUS, WEATHER DATA, AND RADAR DATA, AS WELL AS DATA FROM OTHER SHIPS AND AIRCRAFT. THIS INFORMATION MUST BE USED TO MANAGE THE EW ASSETS AND COORDINATE THE USE OF SOFTKILL AND HARDKILL WEAPONS SYSTEMS TO DEFEND THE FLEET. IT IS POSSIBLE TO GREATLY CONSOLIDATE THE INFORMATION AND EXPAND THE OPERATOR'S CAPABILITY BY DEVELOPING A COMPUTER AIDED CONTROLLER SYSTEM. THE DEVELOPMENT PLAN CONSISTS OF THREE PARTS: 1. REVIEW AND FORMAT THE INFORMATION FOR ALGORITHM DEVELOPMENT. 2. DEVELOP A TEST COUNTERMEASURE CONTROLLER ALGORITHM. 3. IMPLEMENT THE ALGORITHM AND TEST. IT IS PROPOSED THAT THE RESULT OF THIS STUDY WOULD BE THE CONTROLLER ALGORITHM PORTION OF THE EWCS SYSTEM PRESENTLY BEING PLANNED FOR DEVELOPMENT. THE TWCS WOULD PROVIDE THE HARDWARE SYSTEM AND DATA SORTING BY TARGET WHILE THIS STUDY WOULD DEVELOP THE ALGORITHM FOR REAL TIME ASSET MANAGEMENT.

DIGITAL VIDEO PROCESSING INC 7841 EPSILON DR ROCKVILLE, MD 20855 MATTHEW PRICE TITLE: A CMOS ARRAY PROCESSOR BASED ON THE TMS320 T 183 OFFICE: TECOM/CSTA	ARMY	\$ 50,000
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THERE IS CURRENTLY A NEED FOR LOW-POWER, HIGH-PERFORMANCE PROCESSOR

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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MODULES FOR STANDARD BUS CONFIGURATIONS. DEDICATED MODULES, IN THE PAST, HAVE PROVIDED HIGH SPEED PROCESSING, BUT AT THE COST OF HIGH POWER CONSUMPTION AND INFLEXIBILITY. DVP INC., PROPOSES A UNIQUE METHOD TO ACHIEVE A HIGH SIGNAL PROCESSING THROUGHPUT WHILE MAINTAINING LOW POWER OPERATION. IN ADDITION, THE PROPOSED PROCESSOR MODULE WILL NOT BE DEDICATED TO A SINGLE TASK. THE MODULE WILL BE ABLE TO BE CONFIGURED FOR VARIOUS STANDARD MODES OF OPERATION, OR BE CUSTOMIZED BY THE USER FOR SPECIAL PURPOSE APPLICATIONS. THE USE OF STANDARD BUS MODULES OFFERS THE BENEFITS OF RAPID DEVELOPMENT CYCLES AND QUICK SYSTEM INTEGRATION.

DSET LABS INC BOX 1850 - BLACK CANYON STAGE I PHOENIX, AZ 85029 JOHN E BRZUSKIEWICZ TITLE: COATINGS HAVING TAILORED SPECTRAL EMITTANCE CHARACTERISTICS T 96 OFFICE: BRDC	ARMY	\$ 48,572
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MOST SURFACE COATINGS (PAINTS) USED ON THE EXTERIOR OF MILITARY HARDWARE POSSESS HIGH THERMAL EMITTANCE IN THE 3 TO 5 MICRON AND 8 TO 23 MICRON WAVELENGTH REGIONS, MAKING THEM VULNERABLE TO DETECTION USING STATE-OF-THE-ART OPTICAL INFRARED DETECTORS. THIS PROPOSED EFFORT HAS AS ITS OBJECTIVE THE DEVELOPMENT OF SURFACE COATINGS THAT HAVE LOW SPECTRAL EMITTANCE PROPERTIES IN THE SENSITIVE WAVELENGTH REGIONS BY TAILORING OPTICAL PROPERTIES ON THE BASIS OF THE INDIVIDUAL PROPERTIES OF THE CANDIDATE COATING CONSTITUENTS. THE SCOPE OF THE STUDY WILL INCLUDE SELECTING THE MEANS BY WHICH PIGMENTS AND POLYMERIC BINDERS ARE COMBINED, BOTH IN SINGLE AND MULTICOAT (E.G. MULTILAYER) ARRANGEMENTS, TO EFFECTIVELY REDUCE THE RISK OF OPTICAL DETECTION. PHYSICAL MODELS OF THE MOST PROMISING PAINTS, FILMS, COATINGS, APPLIQUES (DECALS), ETC. WILL BE PREPARED AND EVALUATED.

DUNEGAN CORP 19-B THOMAS DR IRVINE, CA 92718 HAROLD L DUNEGAN TITLE: DIGITAL SAFE AND ARM DEVICE T 13 OFFICE: ARDC/SMCAR	ARMY	\$ 49,976
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CURRENT REQUIREMENTS FOR A SAFE AND ARM DEVICE REQUIRED THAT A SAFE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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SEPARATION DISTANCE BE ACHIEVED AFTER FIRING BEFORE THE ARMING SEQUENCE BEGINS. THIS PROPOSAL DEFINES A METHOD OF ACHIEVING THESE NEEDED RESULTS WITH A SAFE AND ARMING DEVICE UTILIZING A VELOCITY INTEGRATOR BASED ON THE DOPPLER EFFECT AND HIGHLY FREQUENCY SOUND WAVES. THIS PROGRAM, IF SUCCESSFUL THROUGH PHASE III, WILL PROVIDE A DIGITAL SAFE AND ARM DEVICE THAT CAN BE PROGRAMMED TO ARM TO A PRESCRIBED DISTANCE AND PRESCRIBED VELOCITY RELATIVE TO THE SOURCE, OVER A WIDE RANGE OF DISTANCES AND VELOCITIES.

DWA COMPOSITE SPECIALTIES INC 21119 SUPERIOR ST CHATSWORTH, CA 91311 MICHAEL A WEBB	NAVY	\$ 49,978
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## TITLE:

EXPLORING THE FEASIBILITY OF COMBINING MATERIALS TO PRODUCE HIGH SPECIFIC MODULUS AND STRENGTH IN A SINGLE COMPOSITE

T 55 OFFICE: NAVSEA

GRAPHITE FIBER IS ONE OF THE MOST VERSATILE REINFORCEMENTS KNOWN. WITH PAN BASED PRECURSOR, TENSILE STRENGTHS UP TO 1.2 msi WILL BE AVAILABLE IN FY1986 AND WITH PITCH BASED PRECURSOR, MODULUS OF ELASTICITY UP TO 140 msi WILL BE AVAILABLE. THE OBJECTIVE OF THIS PROGRAM IS TO EVALUATE THE LIMITS OF SPECIFIC STRENGTH AND SPECIFIC MODULUS THAT CAN BE OBTAINED IN METAL MATRICES THAT ARE APPLICABLE TO ADVANCED NAVY MISSILE SYSTEMS. THIS PROGRAM STARTS WITH BASE PROPERTIES FOR PAN BASED GRAPHITE/METAL AS WELL AS FOR P75 AND P100 GRAPHITE/METAL, WHICH WILL BE USED TO DETERMINE PROPERTY TRANSLATION WHEN P75 AND P100 IS COMBINED WITH PAN FIBER IN A SINGLE CROSSPLY COMPOSITE. IF EFFICIENT PROPERTY TRANSLATION CAN BE ACHIEVED, THE FEASIBILITY OF A SINGLE CROSSPLY COMPOSITE EXHIBITING HIGH SPECIFIC STRENGTH IN ONE DIRECTION AND HIGH SPECIFIC MODULUS IN THE OTHER WILL HAVE BEEN DEMONSTRATED. OTHER POSSIBLE MATERIAL COMBINATIONS WILL ALSO THEN BE INDICATED.

DWA COMPOSITE SPECIALTIES INC 21119 SUPERIOR ST CHATSWORTH, CA 91311 MARK R VAN DEN BERGH	NAVY	\$ 49,928
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## TITLE:

HYBRID MMC MATERIALS FOR JOINING OF THERMALLY MIS-MATCHED MISSILE COMPONENTS DEVELOPMENT

T 56 OFFICE: NAVSEA

THIS PHASE I PROGRAM WILL DEMONSTRATE THE ABILITY OF UTILIZING HYBRID

FISCAL YEAR 1986

SUBMITTED BY

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METAL-MATRIX COMPOSITES (MMC) ON SELECTED NAVY MISSILE STRUCTURES WHERE TWO STRUCTURES, OR SUBELEMENTS OF MARKEDLY DIFFERENT C.T.E. MUST BE ATTACHED. THE UNIQUE ABILITY OF TAILORING VARIOUS MMC'S TO ACHIEVE LOW, INTERMEDIATE, OR HIGH THERMAL-EXPANSION CAPABILITY WHILE CREATING HIGH SPECIFIC MECHANICAL PROPERTIES--FORMS THE BACKBONE OF THIS PROGRAM. SINCE RING STRUCTURES TYPIFY A NOMINAL MISSILE PART, FEASIBILITY WILL BE SHOWN BY FABRICATION AND CTE TESTING OF A HYBRID AXIAL SEGMENT (VIZ. OF A HOOP OR RING STRUCTURE) THAT WILL HAVE LOW (CERAMIC-LIKE) THERMAL DISTORTION ON ONE END, AND A CTE THAT MATCHES THE SUPERALLOY AT THE OPPOSITE END, ALL WITHIN A 3" LENGTH. CONTINUOUSLY REINFORCED Gr-METAL AND ISOTROPIC, DISCONTINUOUSLY REINFORCED DWA WILL MAKE UP THE HYBRID. PHASE I WILL EMPHASIZE ALUMINUM MATRICES; PHASE II (HIGHER USE TEMPERATURES) WILL ALSO INCLUDE Gr-COPPER.

DWA COMPOSITE SPECIALTIES, INC

SDIO

\$ 50,000

21119 SUPERIOR ST

CHATSWORTH, CA 91311

TIMOTHY A LOFTIN

## TITLE:

GRAPHITE ALUMINUM RADIATOR FOR PASSIVE THERMAL MANAGEMENT IN SPACE STRUCTURES

T 4 OFFICE:

TESTING HAS INDICATED THAT METAL-MATRIX COMPOSITE MATERIALS FABRICATED FROM VARIOUS HIGH ELASTIC MODULUS PITCH-BASED GRAPHITE FIBERS EXHIBIT ENHANCED THERMAL CONDUCTIVITY IN THE FIBER DIRECTION. CURRENT DEVELOPMENT PROJECTS WILL RESULT IN THE FABRICATION OF HEAT PIPES OF GRAPHITE FIBERS IN AN ALUMINUM MATRIX. THESE HEAT PIPES WILL BE CAPABLE OF EFFICIENTLY TRANSPORTING WASTE THERMAL ENERGY FROM THE INTERIOR OF A SPACECRAFT TO THE EXTERIOR SURFACE, WHERE IT CAN BE RADIATED AWAY. IT IS PROPOSED THAT DWA COMPOSITE SPECIALTIES, INC. TRANSLATE ITS EXPERIENCE IN THE FABRICATION OF GRAPHITE-ALUMINUM STRUCTURES TO THE FABRICATION OF A HIGH EFFICIENCY SPACE RADIATOR FROM PITCH-BASED GRAPHITE FIBERS IN AN ALUMINUM MATRIX.

DWA COMPOSITE SPECIALTIES, INC

SDIO

\$ 92,789

21119 SUPERIOR ST

CHATSWORTH, CA 91311

MARK R VAN DEN BERGH

## TITLE:

THERMO-MECHANICAL LOAD-PULSE RESISTANT CONTINUOUS FIBER-REINFORCED METAL COMPOSITES

T 7 OFFICE:

THIS PHASE I PROGRAM WILL DEMONSTRATE THE INTRINSIC SURVIVABILITY OF

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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CONTINUOUS-FIBER-REINFORCED METALS TO SIMULATED HIGH FLUX THERMAL PULSE OVERLOADS. GR-METAL COMPOSITE PLATES AND SELECTED TUBES WILL BE FABRICATED WITH FIBER VOLUME-PERCENT LEVELS UP TO 55% BY UTILIZING THE NEW "DWG" TECHNOLOGY DEVELOPED AT DWA. "DWG" IS A NEW LOW-COST PRODUCT FORM THAT EMPHASIZES THIN PLY (.0035" PER LAYER) AND HIGH GRAPHITE FIBER VOLUME-PERCENT LEVELS. THIS PROGRAM PROPOSES THE DISTINCT POSSIBILITY THAT ZERO C.T.E., YET SURVIVABLE COMPOSITE CAN BE ACHIEVED AS A RESULT OF THIS UNIQUE TECHNOLOGY. A SERIES OF PANELS AND SELECTED TUBES WILL BE FABRICATED UTILIZING PICH GRAPHITE TOW IN ALUMINUM MATRICES WITH ALTERNATE SURFACES OF TITANIUM. MECHANICAL TESTING IN BOTH TENSION AND COMPRESSION WITH SIMULATED THERMAL PULSE LOADING SUPERIMPOSED WILL BE CARRIED OUT. A SIGNIFICANT TASK IN THIS PROGRAM WILL BE THE INITIATION OF A PRELIMINARY MECHANICAL-PROPERTY DATA BASIS FOR GR/AL COMPOSITE MATERIALS WITH VARIOUS SURFACE FOILS.

DYNA EAST CORP 3132 MARKET ST PHILADELPHIA, PA 19104 ROBERT D CICCARELLI TITLE: BI-METALLIC SELF-FORGING FRAGMENT (SFF) WARHEAD FOR ENHANCED BEHIND-ARMOR EFFECTS T 27 OFFICE: AFATL/MNW	AF	\$ 61,842
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THE LETHALITY OF ANY DIRECTED-ENERGY WARHEAD IS MEASURED BY ITS ABILITY TO CAUSE IRREPARABLE DAMAGE TO THE VULNERABLE COMPONENTS THAT EXIST BEHIND THE PROTECTIVE ARMOR. THIS DAMAGE IS INCURRED BY THE IMPACT OF THESE COMPONENTS BY EITHER THE PENETRATOR MATERIAL ITSELF OR BY TARGET SPALL MATERIAL GENERATED BY THE INTERACTION OF THE PENETRATOR AND PROTECTIVE ARMOR. SIGNIFICANT IMPROVEMENT IN LETHALITY CAN BE ATTAINED BY THE INCLUSION OF A PYROPHORIC OR INCENDIARY MATERIAL IN THE ATTACKING PENETRATOR. THIS MATERIAL, UPON IMPACT, HAS BEEN SHOWN TO PRODUCE OVERPRESSURE AND THE EXISTANCE OF A THERMAL PULSE WITHIN INTERIOR VEHICLE COMPARTMENTS. ONE PROMISING CONCEPT IS THE INCLUSION OF SUCH AN ENERGETIC MATERIAL IN A "FOLLOW-THROUGH" SELF-FORGING FRAGMENT (SFF) PENETRATOR.

DYNA EAST CORP 3132 MARKET ST PHILADELPHIA, PA 19104 ROBERT D CICCARELLI TITLE: NOVEL SHAPED CHARGE JET FORMATION T 27 OFFICE: AFATL/MNW	AF	\$ 66,565
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RECENT IMPROVEMENTS IN ADVANCED ARMOR TECHNOLOGY, INCLUDING THE



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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INTRODUCTION OF EFFECTIVE APPLIQUE ARMOR, PRESENT A SPECIAL CHALLENGE FOR THE ANTI-TANK MISSILE WARHEAD DESIGNER. TWO GENERAL APPROACHES TO MEET THIS CHALLENGE APPEAR FEASIBLE: IMPROVEMENTS IN UNITARY WARHEADS AND THE INCORPORATION OF MULTISTAGE WARHEADS. MULTISTAGE WARHEAD SYSTEMS CURRENTLY UNDER DEVELOPMENT APPEAR TO OFFER SIGNIFICANT PERFORMANCE GAINS BUT MAY BE DIFFICULT, IF NOT IMPOSSIBLE, TO INCORPORATE INTO A MISSILE SYSTEM IN VIEW OF SEVERE WEIGHT AND SPACE LIMITATIONS AND OTHER ENGINEERING DIFFICULTIES. THIS PROPOSAL ADDRESSES ONE OF SEVERAL AVAILABLE APPROACHES FOR THE IMPROVEMENT OF UNITARY ANTI-TANK MISSILE WARHEADS.

DYNAMET TECHNOLOGY INC EIGHT A ST BURLINGTON, MA 01803 STANLEY ABKOWITZ TITLE: PRELIMINARY EVALUATION OF P/M TITANIUM TECHNOLOGY FOR ECONOMICAL MANUFACTURE OF TITANIUM PROPELLANT TANKS T 148 OFFICE: NWSC	NAVY	\$ 48,310
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DYNAMET TECHNOLOGY INC. WILL DEVELOP AND FABRICATE A SUBSIZE PRPTOTYPE Ti-6Al-4V ALLOY GAS GENERATOR/PROPELLANT TANK PREFORM USING ADVANCED POWDER METAL TECHNOLOGY. THE PROTOTYPE COMPONENT, ALONG WITH TEST BARS, WILL BE FABRICATED BY COLD ISOSTATIC PRESSING, VACUUM SINTERING AND HOT ISOSTATIC PRESSING (CHIP PROCESS). IN ADDITION TO PRODUCING THESE COMPONENTS BY CHIP PROCESSING, HEAT TREATMENT STUDIES WILL BE CONDUCTED IN ORDER TO ACHIEVE THE HIGHEST STRENGTH LEVELS POSSIBLE. THE FABRICATED GAS GENERATOR TANK WILL BE HYDRO-TESTED TO FAILURE AS AN IN-SERVICE PERFORMANCE EVALUATION. THESE RESULTS WILL BE COMPARED WITH THOSE OBTAINED FROM TENSILE TESTS OF WITNESS BARS. THESE MECHANICAL TESTS WILL BE COMBINED WITH METAL-LOGRAPHIC EXAMINATIONS TO PROVIDE AN INITIAL EVALUATION OF P/M TITANIUM MATERIALS AND FABRICATION TECHNOLOGY FOR THIN WALL PRESSURE VESSELS. IN ADDITION, A PRELIMINARY ECONOMIC ASSESSMENT OF THE PRODUCTION PROCESS WILL BE CONDUCTED.

DYNAMICS TECHNOLOGY INC 21311 HAWTHORNE BLVD - STE 300 TORRANCE, CA 90503 ANDREW T LINTZ TITLE: THERMAL LAYER SIMULATION T 2 OFFICE: AM/SBIR	DNA	\$ 52,546
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THERE EXISTS A REQUIREMENT TO DEVELOP AN UNDERSTANDING OF AND A

FISCAL YEAR 1986

SUBMITTED BY

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TECHNIQUE FOR SIMULATING THE THERMAL LAYER ASSOCIATED WITH A NEAR SURFACE NUCLEAR EVENT. A FLUID PHYSICS BASED MODEL OF THE THERMAL LAYER HAS BEEN DEVELOPED BY DYNAMICS TECHNOLOGY AND A SIMULATION TECHNIQUE HAS BEEN PROPOSED. A KEY ASPECT OF THE THERMAL LAYER MODEL, THE CHARACTERISTIC VERTICAL LENGTH SCALE, HAS BEEN INFERRED FROM NUCLEAR FILMS BUT NOT YET TESTED. THE PRESENT PROPOSAL PROVIDES FOR LABORATORY TESTING OF THE LENGTH SCALE MODEL AND CONCURRENTLY DEMONSTRATING A THERMAL LAYER SIMULATION TECHNIQUE BY LIGHT GAS INJECTION.

DYNAMICS TECHNOLOGY, INC  
21213 HAWTHORNE BLVD., SUITE 300  
TORRANCE, CA 90503  
DUANE T HOVE

SDIO

\$ 51,191

TITLE:

KINETIC ENERGY PROJECTILES FOR ENHANCED SOFT TARGET LETHALITY

T 8 OFFICE:

KINETIC ENERGY WARHEADS HAVE HISTORICALLY BEEN DESIGNED TO DEFEAT ARMOR OR OTHER HARD TARGETS. HOWEVER, HYPERVELOCITY PENETRATORS COULD PASS THROUGH SOFT TARGETS SUCH AS BOOSTERS AND BUSES WITH ONLY LOCALIZED DAMAGE. THIS PROPOSAL ADDRESSES THE PRELIMINARY DESIGN OF A PASSIVE KEW PROJECTILE WHICH WOULD SPREAD RADIALY UPON CONTACT WITH A THIN SKINNED VEHICLE AND, THEREFORE, ENHANCE THE DAMAGE INFLICATED UPON SOFT MECHANICAL, HYDRAULIC AND ELECTRICAL COMPONENTS. PROJECTILE CONCEPTS WILL BE DEVELOPED AND SCREENING TESTS WILL BE CONDUCTED AT LOW SPEEDS WITH SPECIALLY SELECTED MATERIALS TO DEMONSTRATE CONCEPT FEASIBILITY. SUCCESSFUL DESIGN CONCEPTS WILL BE CARRIED TO PRELIMINARY DESIGN AND TESTED IN BALLISTIC RANGES OR ELECTROMAGNETIC RAIL GUN FACILITIES IN PHASE II.

DYNATHERM CORP  
1 BEAVER CT  
COCKEYSVILLE, MD 21030  
DAVID A WOLF

NAVY

\$ 52,587

TITLE:

FLEXIBLE HEAT PIPE SWITCH

T 145 OFFICE: NWSC

A PASSIVE VARIABLE THERMAL RESISTANCE DEVICE IS PROPOSED WHICH

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>UTILIZES A FLEXIBLE HEAT PIPE SWITCH. THE PRINCIPLE ELEMENT OF THE SWITCH IS A HEAT PIPE CHAMBER WITH A FLEXIBLE ENVELOPE. THE SWITCH IS PERMANENTLY ATTACHED TO THE HEAT SOURCE. INCREASING SOURCE TEMPERATURE ELEVATES THE HEAT PIPE TEMPERATURE AND PRESSURE, EXPANDING ITS ENVELOPE TO CONTACT THE SINK. DECREASING SOURCE TEMPERATURE CAUSES THE HEAT PIPE ENVELOPE TO CONTRACT, INTERRUPTING CONDUCTIVE HEAT TRANSFER TO THE SINK. THE VARIABLE CONDUCTANCE HEAT TRANSFER PATH TO THE SINK ENABLES THE SWITCH TO MAINTAIN CONSTANT SOURCE TEMPERATURE OVER A WIDE RANGE OF HEAT LOAD AND/OR SINK CONDITIONS. PROOF-OF-PRINCIPLE HAS BEEN DEMONSTRATED IN A PREVIOUS NASA SPONSORED PROGRAM. INVESTIGATION OF DESIGN MODIFICATIONS TO ADAPT THE PRINCIPLE TO MEET THE DESIGN REQUIREMENTS OF A VARIABLE THERMAL RESISTANCE DEVICE IS PROPOSED. PHASE I OF THE PROPOSED EFFORT WILL CULMINATE IN THE DESIGN, FABRICATION AND TEST OF A PROTOTYPE SWITCH IN A REPRESENTATIVE OPERATIONAL ENVIRONMENT.</p>		

E-TEK DYNAMICS INC 250 EAST DR MELBOURNE, FL 32904 J J PAN TITLE: INTEGRATE FIBER OPTIC THEORY INTO INTEGRATED CIRCUIT TECHNOLOGY T 40 OFFICE: ESD/XRCT	AF	\$ 48,569
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E-TEK PROPOSES TO INVESTIGATE THE UNIFIED THEORY AND TECHNOLOGY OF MICROWAVES, FIBER OPTICS, INTEGRATED CIRCUITS, MICROWAVE MONOLITHIC ICs (MMICS), Gb/s LOGICS, AND ELECTRO-OPTIC (EO) INTEGRATED OPTIC CIRCUITS FOR HIGH SPEED OPTICAL SIGNAL PROCESSING. WAVE PROPAGATION, TRANSMISSION, NETWORK, CIRCUITS, DEVICES, MATERIALS, FABRICATION TECHNIQUES, AND SUBSYSTEM/SYSTEM APPLICATIONS AT MICROWAVE FREQUENCIES WILL BE STUDIED IN DETAIL. IN ADDITION TO THE DESIGN OF OPTICAL SWITCHING DEVICES, E-TEK WILL INVESTIGATE THE DESIGN AND FABRICATION FEASIBILITIES OF OTHER OPTICAL SIGNAL PROCESSORS, SUCH AS MODULATOR, SAMPLER, LOGICS, MULTIPLEXER/DEMULTIPLEXER, COUPLERS, DIVIDER/COMBINER, FILTER, CORRELATORS, ETC.. PRESENTLY, E-TEK HAS SUCCESSFULLY DESIGNED/FABRICATED/TESTED A 20 GHz INTERFEROMETRIC (EO) MODULATOR ON LiNbO<sub>3</sub> SUBSTRATE USING THE CONVENTIONAL DESIGN APPROACH.

E-TEK DYNAMICS INC 250 EAST DR MELBOURNE, FL 32904 J J PAN TITLE: FIBER DISTRIBUTION NETWORK T 109 OFFICE: AFWAL/AA	AF	\$ 49,733
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DURING PHASE I, E-TEK WILL INVESTIGATE, COMPUTE/SIMULATE, DESIGN,

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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AND OPTIMIZE A 1.3 Uum SINGLE-MODE 1:100 OPTIC FIBER SPLITTER USING A GRADED-INDEX (GRIN) LENS. THE SPLITTER WILL HAVE ANTICIPATED EXCESS LOSS OF < 4 db AND LOSS DEVIATION OF < + OR - 5%. THE PROPOSED APPROACH HAS THE ADVANTAGES OF MASS PRODUCIBILITY, POTENTIALLY LOW COST, CAPABILITY OF OPERATING IN ADVERSE ENVIRONMENTS, NO PHASE-ERROR INTRODUCED AT MICROWAVE MODULATED FREQUENCIES, AND THE POTENTIAL OF EXPANDING TO 1:1,000 OR EVEN 1:5,000 SPLITTING RATIO. IN ADDITION TO THE USE OF THE COMMERCIALY AVAILABLE GRIN LENS, E-TEK WILL OPTIMIZE THE INDEX PROFILE TO IMPROVE THE LOSS DEVIATION. MULTILAYER FIBER-LENS INTERFACE UNIT WILL BE OPTIMIZED TO REDUCE EXCESS LOSS CONTRIBUTED BY FIBER MISALIGNMENT AND FRACTIONAL LOSS, AND TO IMPROVE PRODUCIBILITY.

ECODYNAMICS RESEARCH ASSOCS INC PO BOX 8172 ALBUQUERQUE, NM 87198 DR PATRICK J ROACHE TITLE: ADAPTIVE GRIDS FOR RAVEN T 86 OFFICE: AFWL/PRC	AF	\$ 72,240
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THIS PROPOSAL IS FOR A STUDY OF THE FEASIBILITY OF ADAPTIVE GRID ALGORITHMS FOR IMPLEMENTATION, REFINEMENT AND INCORPORATION INTO AN EXISTING TIME DEPENDENT THREE DIMENSIONAL NAVIER-STOKES COMPUTER MODEL, THE RAVEN CODE. THE STUDY WILL INVOLVE ASSESSMENT AND/OR EXTENSION OF EXISTING ADAPTIVE GRID TECHNIQUES TO DETERMINE THAT WHICH IS OPTIMAL AND EFFICIENT FOR THE PHASE II IMPLEMENTATION IN RAVEN, WITH CONSIDERATION GIVEN TO THE COMPUTER ARCHITECTURE OF THE CRAY XMP AND 2S SYSTEMS. ALSO, THE WORK WILL INVOLVE EVALUATION OF MORE ADVANCED FLUID DYNAMIC SOLUTION ALGORITHMS FOR INCORPORATION INTO THE RE-STRUCTURED RAVEN. THE COMBINATION OF ADAPTIVE GRID GENERATION AND ADVANCED FLUID DYNAMIC ALGORITHMS, BOTH TAILORED TO SUPER-COMPUTER ARCHITECTURE, HAS TREMENDOUS POTENTIAL FOR IMPROVING THE EFFICIENCY, EASE OF USE, ROBUSTNESS, AND ACCURACY OF SOLUTIONS.

EDWARDS COMMUNICATIONS ELECTRO-OPTICS 335 PARK ST NE VIENNA, VA 22180 RAJ B EDWARDS TITLE: MINIATURIZED MAGNETIC SENSORS T 51 OFFICE: NAVSEA	NAVY	\$ 49,999
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THE PRIMARY OBJECTIVE IS TO CATAGORICALLY DETERMINE THE TECHNICAL

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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FEASIBILITY OF THE THERMALLY, ACOUSTICALLY AND OPTICALLY COMPENSATED, ULTRA-LOW-NOISE, "ALL-PASSIVE" MINIATURIZED FIBER-OPTIC MAGNETIC SENSOR. SUPPORTING OBJECTIVES ARE: 1) CHARACTERIZATION OF THE MAGNETIC SENSOR'S OPERATIONAL ENVIRONMENT; 2) DEFINITION OF THE PRELIMINARY SYSTEM REQUIREMENTS; 3) ASSESSMENT OF COMPONENTS, SUBSYSTEMS AND SYSTEM; 4) EVALUATION OF DESIGN MARGINS THROUGH FIRST-ORDER MODELING AND ANALYSIS OF MINIATURIZED DESIGN EMBODYING PREFERRED CONCEPT AND MODIFIED CONFIGURATIONS; 5) ESTIMATION OF PRACTICAL DESIGN MARGINS, AND TOLERANCES IN ACHIEVING A STABLE MAGNETIC SENSOR PERFORMANCE IN THE DEEP SEA ENVIRONMENT OF 1 NANOTESLA. EDWARDS COMMUNICATIONS ELECTRO-OPTICS IN VIENNA, VA WITH CONSULTATIONAL ASSISTANCE FROM MIT PROF. S EZEKIEL, MIT CAMBRIDGE, MA EVALUATES TECHNICAL FEASIBILITY OF THE INNOVATIVE CONCEPT THROUGH FIRST-ORDER MODELLING AND ANALYZES OF THE COMPENSATED MAGNETIC SENSOR SYSTEM. THE EFFORT WILL ADDRESS THE PROJECT OBJECTIVES INDIVIDUALLY IN FIVE INTERRELATED SUBTASKS.

EIC LABS INC 111 DOWNEY ST NORWOOD, MA 02062 DAVID A SCHWARTZ TITLE: ADVANCED TECHNOLOGY BATTERY TO REPLACE THE BA5590/U T 9 OFFICE: DARPA	DARPA	\$ 49,921
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THE PROPOSED RESEARCH AND DEVELOPMENT WILL FOCUS ON THE DESIGN, CONSTRUCTION AND TESTING OF A Li/TiS(2) RECHARGEABLE CELL THAT WOULD BE USED IN THE BA5590/U CONFIGURATION. DESIGN TRADE-OFFS SUCH AS RATE CAPABILITY, CYCLE LIFE, CAPACITY AND COST WOULD BE CONSIDERED. TWO DESIGNS WOULD BE CHOSEN. SEVEN CELLS OF EACH WOULD BE BUILT AND TESTED. THE GOAL OF THE PROGRAM WOULD BE TO DEMONSTRATE A RECHARGEABLE CELL HAVING PERFORMANCE SUPERIOR TO THAT OF THE PRIMARY.

EIC LABS INC 111 DOWNEY ST NORWOOD, MA 02062 K M ABRAHAM TITLE: ADVANCED BATTERY CATALYSTS - PREPARATION AND DEVELOPMENT T 114 OFFICE: NSWC	NAVY	\$ 50,000
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A RESEARCH PROGRAM AIMED AT STUDYING THE MECHANISM OF ELECTRO-

FISCAL YEAR 1986

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DEPT

AWARDED  
AMOUNT

CATALYSIS IN THE  $\text{Li}/\text{SOCl}_2$  IS PROPOSED. THE CATALYTIC ACTIVITY OF CARBON CATHODES IMPREGNATED WITH COBALTOUS OXIDE ( $\text{CoO}$ ), COBALTIC OXIDE ( $\text{Co}_2\text{O}_3$ ) OR  $\text{Co}$  TOWARDS THE REDUCTION OF  $\text{SOCl}_2$  WILL BE ASSESSED. METHODS ARE PRESENTED FOR THE PREPARATION OF THESE CATALYSTS. THE RESULTS OF ELECTROCATALYSIS BY THESE MATERIALS WILL BE COMPARED WITH THAT OBSERVED IN  $\text{Li}/\text{SOCl}_2$  CELLS UTILIZING COBALT-DIBENSOTETRAAZAANNULENE ( $\text{Co-TAA}$ ) AS THE CATALYST. A MECHANISM FOR ELECTROCATALYSIS IN THE  $\text{Li}/\text{SOCl}_2$  CELL, PARTICULARLY THAT PERTAINING TO  $\text{Co-TAA}$  CATALYSIS, WILL BE DESCRIBED. IT IS ENVISIONED THAT A SYSTEMATIC PHASE II INVESTIGATION BASED ON THE FOUNDATION LAID IN THIS PHASE I RESEARCH, WOULD LEAD TO THE ABILITY TO DESIGN AND DEVELOP SUPERIOR CATALYSTS NOT ONLY FOR THE  $\text{Li}/\text{SOCl}_2$  CELL BUT ALSO FOR CELLS SUCH AS THE  $\text{Li}/\text{SO}_2$  AND  $\text{Li}/\text{SO}_2\text{Cl}_2$ .

EIC LABS INC  
111 DOWNEY ST  
NORWOOD, MA 02062  
JOSEPH S FOOS

ARMY

\$ 49,920

## TITLE:

ELECTROLYTE ADDITIVES FOR RECHARGEABLE LITHIUM BATTERIES

T 77

OFFICE: LABCOM/ETDL

THERE IS AN ACTIVE INTEREST IN RECHARGEABLE LITHIUM BATTERIES DUE TO THE HIGH ENERGY DENSITIES POSSIBLE. THESE HIGH ENERGY DENSITIES REQUIRE THE CYCLING OF THE LITHIUM ELECTRODE IN HIGH EFFICIENCY. IT HAS BEEN DEMONSTRATED THAT ELECTROLYTE COMPOSITION PLAYS A LARGE ROLE IN LITHIUM CYCLING EFFICIENCY AND THAT ADDITIVES CAN HAVE LARGE POSITIVE EFFECTS. WE HAVE IDENTIFIED SEVERAL NEW CATEGORIES OF MATERIALS THAT ARGUABLY SHOULD GIVE POSITIVE ADDITIVE EFFECTS. THE PHASE I PROGRAM WILL EVALUATE THESE MATERIALS CHIEFLY IN TERMS OF LITHIUM CYCLING EFFICIENCY.

EIC LABS INC  
111 DOWNEY ST  
NORWOOD, MA 02062  
K M ABRAHAM

NAVY

\$ 50,000

## TITLE:

STUDIES OF THE FUNDAMENTALS OF SOLID STATE BATTERIES

T 8

OFFICE: ONR

A RESEARCH PROGRAM AIMED AT STUDYING THE FUNDAMENTALS OF SOLID STATE

FISCAL YEAR 1986

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AMOUNT

BATTERIES WHICH OPERATE AT OR NEAR ROOM TEMPERATURE IS PROPOSED. THE RELEVANT DATA WILL BE OBTAINED BY STUDYING THE ELECTROCHEMICAL BEHAVIOR OF A SOLID STATE RECHARGEABLE Li CELL OF THE CONFIGURATION, WHERE MEEP IS POLY(BIS[METHOXY ETHOXY ETHOXIDE)PHOSPHAZENE].

EIC LABS., INC  
111 DOWNEY ST  
NORWOOD, MA 02062  
R DAVID RAUH

SDIO

\$ 50,732

TITLE:

FAST ELECTROCHROMIC SWITCHING FOR OPTICAL HARDENING APPLICATIONS

T 11

OFFICE:

A PROGRAM TO DEVELOP ELECTROCHROMIC DEVICES CAPABLE OF FAST TRANSMISSIVE TO REFLECTIVE OPTICAL SWITCHING IS PROPOSED. THESE DEVICES WOULD BE USED FOR OPTICAL HARDENING IN THE WAVELENGTH RANGE FROM 0.6-15 MICROMETERS. OPTICAL SWITCHING ELEMENTS BASED ON SINGLE CRYSTAL LAYERS OR EPITAXIAL FILMS OF THE METAL DICHALOCOGENIDES  $ZrS(2)$  AND  $Hf(2)$  WOULD BE DEVELOPED. WE PROPOSE TO INTERCALATE SINGLE CRYSTALS OF  $ZrS(2)$  AND  $HfS(2)$  WITH  $LiI$ . UNDER THE APPLICATION OF AN EXTERNALLY APPLIED CURRENT PULSE, THE  $LiI$  WILL UNDERGO A REDUCTION/OXIDATION REACTION THAT CONTRIBUTES A FREE-ELECTRON TO THE CONDUCTION BAND OF THE HOST CRYSTAL. THE PROPOSED DEVICES WOULD HAVE A VARIABLE FREE-ELECTRON DENSITY THAT COULD BE CONTROLLED BETWEEN  $<10(16)$  TO  $10(22)$  -E/CUBIC CENTIMETERS. THE LARGE VARIATION OF FREE-ELECTRON DENSITY ALLOWS THE WAVELENGTH AND DEGREE OF SPECULAR REFLECTANCE TO BE MODULATED. OPTICAL SWITCHING WOULD BE ACHIEVED IN A 3-LAYER DEVICE COMPRISED OF THE OPTICALLY ACTIVE ELEMENT ( $ZrS(2)/LiI$  OR  $HfS(2)/LiI$  AND TWO TRANSPARENT ELECTRODES. A MODEST CURRENT PULSE ( $<200$  mA/SQUARE CENTIMETERS) WOULD BE USED TO SWITCH THE DEVICE FROM TRANSMITTING TO REFLECTING. BY HAVING THE  $LiI$  REDUCTION/OXIDATION CENTERS HOMOGENEOUSLY DISTRIBUTED IN THE VAN DER WAALS' GAPS OF THE  $ZrS(2)/LiI$  AND  $HfS(2)/LiI$  CRYSTALS, THE OPTICAL SWITCHING SHOULD BE EXTREMELY RAPID. THE GOAL OF THE PROPOSED RESEARCH IS TO DEVELOP OPTICAL HARDENING DEVICES THAT UNDERGO REVERSIBLE TRANSMISSIVE TO REFLECTIVE SWITCHING IN  $<10$  TO THE MINUS SIX POWER SECONDS.

EIC LABS., INC.  
111 DOWNEY ST  
NORWOOD, MA 02062  
R DAVID RAUH

SDIO

\$ 53,814

TITLE:

NICKEL OXIDE/HYDROGEN MULTILAYER BIPOLAR BATTERY  
DEVELOPMENT FOR PULSED POWER DEVELOPMENT

T 5

OFFICE:

SPACE-BASED MISSILE DEFENSE SYSTEMS WILL REQUIRE SOURCES OF PULSED

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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<p>POWER TO OPERATE PROSPECTIVE DIRECTED ENERGY WEAPONS. POWER MUST BE AVAILABLE INSTANTANEOUSLY AND SEQUENTIAL POWER PULSES MUST HAVE MINIMAL INTERPULSE DELAYS. IN PRINCIPLE, AN ELECTROCHEMICAL POWER SOURCE CAN PROVIDE POWER AT A MUCH LOWER WEIGHT THAN ALTERNATIVE MAGNETIC OR ELECTRIC FIELD DEVICES (CAPACITORS OR INDUCTORS). HOWEVER, ADVANCES MUST BE MADE IN HIGH RATE THIN FILM ELECTRODE MATERIALS AND BATTERY DESIGN IN ORDER TO ACHIEVE BATTERIES OPTIMIZED FOR HIGH POWER DENSITY IN THE PULSED MODE OF OPERATION. IN PHASE I, THE ELECTROCHEMICAL CAPACITIES UNDER PULSED CONDITIONS WILL BE INVESTIGATED FOR TWO PROMISING MATERIALS: (1) LaNi<sub>5</sub> WHICH ACTS AS A HYDROGEN STORAGE ANODE WITH HIGH HYDROGEN DIFFUSION RATES, AND (2) A HYDRATED NICKEL OXIDE CATHODE WITH OPTIMIZED MIXED IONIC AND ELECTRONIC CONDUCTIVITY. THE ELECTRODES COMBINE TO FORM A HIGHLY REVERSIBLE NICKEL OXIDE/HYDROGEN (HYDRIDE) BATTERY COUPLE. AS THIN FILMS PREPARED BY SPUTTERING UNDER CONTROLLED CONDITIONS, IT IS ANTICIPATED THAT THE ELECTRODES WILL BE CAPABLE OF &gt;100 SEQUENTIAL PULSES OF 10 TO THE MINUS 3 SEC DURATION, BEFORE RECHARGE, EACH PULSE WITH A POWER DENSITY OF &gt;10 TO THE 3RD POWER W/CUBIC CENTIMETERS. FULL MULTILAYER BIPOLAR BATTERIES OF 10 TO THE 5TH POWER W/kg PULSE OR GREATER COULD BE CONSTRUCTED BASED ON THE PERFORMANCE.</p>		

EIDFTICS INTERNATIONAL  
36 W 240TH ST  
TOE ANCE, CA 90505  
ROBERT W FOLTYN

AF

\$ 49,407

## TITLE:

INNOVATIVE AIR COMBAT MEASURES OF MERIT FOR SUPERMANEUVERABLE  
FIGHTER AIRCRAFT DEVELOPMENT

T 142 OFFICE: AFWAL/FI

RECENT TECHNOLOGICAL ADVANCES HAVE ASSURED THE POSSIBILITY OF RADICALLY EXPANDING THE MANEUVERING ENVELOPE OF FUTURE FIGHTER DESIGNS. INCREASES IN FORCE AND MOMENT GENERATION AS WELL AS ENHANCED DEPARTURE RESISTANCE WILL ENABLE THE NEXT GENERATION OF FIGHTERS TO PERFORM MANEUVERS BEYOND TODAY'S CONVENTIONAL FLIGHT BOUNDARIES. WHILE THE FEASIBILITY OF SUCH MANEUVERS, REFERRED TO AS SUPERMANEUVERS, HAS BEEN DEMONSTRATED, THEIR APPLICABILITY AND MERIT HAS NOT BEEN FULLY EVALUATED. DEVELOPMENT OF THE ENABLING TECHNOLOGY HAS PRECEDED THAT OF SUITABLE MEASURES OF MERIT AND DEFINITION OF SPECIFIC SUPERMANEUVERABILITY REQUIREMENTS. THE OBJECTIVE OF THE PROPOSED STUDY IS TO DEFINE SPECIFIC SUPERMANEUVERS AND DEVELOPE



FISCAL YEAR 1986

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MEASURES OF MERIT FOR THEIR ASSESSMENT. A LARGE VOLUME OF AIR COMBAT MANEUVERING (ACM) AND SUPERMANEUVERABILITY DATA WILL BE ANALYZED USING THE TACTS/ACMI SYSTEM AND PREVIOUS STUDIES RELATED TO SUPER-MANEUVERABILITY TECHNOLOGY. THE OBJECTIVES WILL BE SPECIFICALLY MET THROUGH MATHEMATICAL MODELLING AND SIMULATION.

ELDRIDGE ASSOCS INC 1142 MANHATTAN AVE - CP 94 MANHATTAN BEACH, CA 90266 BARBARA J HOOVER TITLE: TABS-2 PROGRAM SYSTEM CONVERSION TO MINI-SYSTEM ENVIRONMENT T 202 OFFICE: WES	ARMY	\$ 49,837
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THE TABS-2 PROGRAM SYSTEM IS USED EXTENSIVELY BY THE U.S. ARMY CORPS OF ENGINEERS. CURRENTLY PROGRAMS IN THE SYSTEM RUN ON A CDC CYBER 205 MAIN FRAME COMPUTER. THE CORPS WISHES TO HAVE THE SYSTEM OF PROGRAMS AND ITS USER INTERFACE CONVERTED TO RUN ON A VAX MINI-COMPUTER AT GREATLY REDUCED COST.

ELECTRO MAGNETIC APPLICATIONS INC PO BOX 8482 ALBUQUERQUE, NM 87198 DAVID E MEREWETHER TITLE: LOW COST ELECTROMAGNETIC SHIELDING T 198 OFFICE: CERL/COE	ARMY	\$ 49,800
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TEN POTENTIALLY LOW COST SHIELDING TECHNIQUES ARE TO BE INVESTIGATED. COMPARISONS ARE TO BE MADE OF THE SHIELDING EFFECTIVENESS, CONSTRUCTION COST, AND SHIELD RELIABILITY FOR TEN POTENTIALLY LOW COST SHIELD FABRICATION TECHNIQUES.

ELECTRO TECHNOLOGY CORP 5656 SOLEDAD RD LA JOLLA, CA 92037 ROBERT J CAMPANA TITLE: THERMOELECTROMAGNETIC PUMP DEVELOPMENT STUDY T 4 OFFICE:	SDIO	\$ 50,000
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THERMOELECTROMAGNETIC PUMPS (TEMPS) RESULT FROM THE INTEGRATION OF

FISCAL YEAR 1986

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A THERMOELECTRIC GENERATOR (TEG) AND AN ELECTROMAGNETIC PUMP (EMP). TEMPS ARE USEFUL SAFETY COMPONENTS OF NUCLEAR SPACE POWER SYSTEMS. THEY ARE USED IN THE DECAY-HEAT-REMOVAL SYSTEM WHERE THEY USE DECAY HEAT ITSELF AS THE SOURCE OF ENERGY TO MAINTAIN CIRCULATION OF COOLANT FOR AS LONG AS THERE IS DECAY HEAT TO BE DISCIPATED AFTER THE REACTOR IS SHUTDOWN OR PUT IN DORMANT READINESS. THE ONLY TEMP USED TO DATE WAS IN THE 500-W SNAP-10A SYSTEM FLOWN IN THE 1960S. THERE HAS BEEN NO TEMP DEVELOPMENT SINCE THEN. THE QUESTION IS "ARE TEMPS FEASIBLE FOR USE IN SDI POWER SYSTEMS"? THE POWER LEVELS IN SDI GO UP 10S OF MWS MAKING HIGH POWER DENSITY AND HIGH TEMPERATURES NECESSARY. WITH ADVANCES MADE IN PERMANENT-MAGNET AND ELECTROMAGNET CORE MATERIALS AND THERMOELECTRIC SEMICONDUCTORS TEMPS MAY STILL BE FEASIBLE IN SDI NUCLEAR POWER SYSTEMS. THE PROPOSED STUDY WILL BE A DISCIPLINED PARAMETRIC ANALYSIS TO PROVIDE ANSWERS TO THIS QUESTION AND GUIDANCE FOR CONTINUED DEVELOPMENT, ASSUMING A POSITIVE RESULT.

ELECTRO-OPTEK CORP  
23887 MADISON ST  
TORRANCE, CA 90505  
WILLIAM S CHAN

AF

\$ 49,718

## TITLE:

A DYNAMIC SCENE GENERATOR DEVELOPMENT  
T 291 OFFICE: AEDC/DOT

THE PROPOSED PROGRAM IS THE DEVELOPMENT OF A UNIQUE TECHNIQUE BY WHICH A LARGE MOSAIC ARRAY OF SINGLE-CRYSTALLINE SILICON RESISTORS, EACH SUSPENDED ACROSS A HOLLOW CAVITY, IS FABRICATED USING CONVENTIONAL INTEGRATED CIRCUIT (IC) TECHNOLOGY. EACH RESISTOR, HEATED BY AN ELECTRIC CURRENT, FORMS A BLACKBODY RADIATOR. AND EACH CURRENT IS CONTROLLED BY A METAL-OXIDE-SEMICONDUCTOR (MOS) TRANSISTOR CIRCUIT, WHICH IS ALSO FABRICATED ALONGSIDE EACH RESISTOR. THE RESULTANT MOS-RESISTOR ARRAY PROVIDES A HIGHLY-CONTROLLABLE INFRARED (IR) SCENE GENERATOR CAPABLE OF MEETING ALL THE DIVERSE REQUIREMENTS. A FOCUSED, THREE-PHASE PROGRAM IS DELINEATED WITH PHASE I AIMED AT DEMONSTRATING THE CRITICAL ELEMENTS OF THE MOS-RESISTOR ARRAY TECHNOLOGY WITH LOW RISK; PHASE II AIMED AT SCALING THIS TECHNOLOGY TO DEMONSTRATE A 128 X 128 GENERATOR ARRAY WITH INTERCONNECTING SUPPORT ELECTRONICS; AND PHASE 3 AIMED AT INTEGRATING A COMPLETE GENERATOR ARRAY OF 512 X 512 WITH CONTROL ELECTRONICS, COMPUTER DATA MANAGEMENT AND FULL RADIOMETRIC CALIBRATION.

FISCAL YEAR 1986

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ELECTRO-OPTEK CORP 23887 MADISON ST TORRANCE, CA 90505 J SHIE TITLE: SEEKER-TO-TARGET CLOSURE SIMULATOR T 25 OFFICE: AFATL/ASA	AF	\$ 57,223

THE DEVELOPMENT OF THE SILICON RESISTOR ARRAY TECHNOLOGY HAS BEEN PROPOSED TO FABRICATE AN IR (INFRARED) AIR TARGET SIMULATOR SPECIFICALLY FOR SIMULATING, TESTING AND MODELING OF SEEKER-TO-TARGET RANGE CLOSURE CONDITIONS. EACH RESISTOR HEATED BY A PASSAGE OF CURRENT ACTS AS A BLACKBODY RADIATOR, AND THIS CURRENT IS INDIVIDUALLY CONTROLLED BY A MOS (METAL-OXIDE-SEMICONDUCTOR) CIRCUIT (ONE OF EACH RESISTOR). THE WHOLE ARRAY MAY BE PROGRAMMED TO PROVIDE A SINGLE IR TARGET OR A CONTINUOUS CHANGING EXTENDED TARGET TO SIMULATE THE HOMING EFFECT OF A SEEKER SENSOR ONTO THE TARGET. THE PROPOSED EFFORT IN PHASE I OF A THREE PHASE PROGRAM, WITH PHASE I TASKED TO DESIGN A TEST MOS-RESISTOR ARRAY AIMED AT DEMONSTRATING THE CRITICAL ELEMENTS OF MOS-RESISTOR FORMATION AND FLICKER CONTROL. A PRELIMINARY DESIGN OF AN OPTICAL SYSTEM TO SIMULATE SEEKER-TO-TARGET CLOSURE IS ALSO MADE IN PHASE I.

ELECTRO-OPTEK CORP 23887 MADISON ST TORRANCE, CA 90505 MICHAEL LEE TITLE: MULTI MEGARAD HARD MICRO-CIRCUITS T 5 OFFICE: AM/SBIR	DNA	\$ 57,998
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AN INNOVATIVE APPROACH TO PRODUCE MULTI-MEGARAD HARD ELECTRONIC DEVICES FOR SPACEBORNE APPLICATIONS HAS BEEN PROPOSED, WHEREBY JUNCTION FIELD EFFECT TRANSISTORS (JFET) ARE DEVELOPED USING SILICON-ON-INSULATOR (SOI) TECHNOLOGY. THE MULTIMEGARAD HARDNESS IS DERIVED FROM THE 'BURIED' CHANNEL OF THE JFET DEVICES AND THE REDUCTION OF ELECTROMIGRATION OF TRAPPED AND INDUCED CHARGES OF THE WELL-MATCHED SILICON/OXIDE INTERFACE OF THE SILICON-ON-INSULATOR WAFER, FABRICATED BY OXYGEN IMPLANT OF SILICON WAFER. THIS PROPOSED EFFORT IS PHASE 1 OF A 3-PHASE PROGRAM, CONCEIVED SPECIFICALLY TO EXPLOIT THE EMERGING SOI TECHNOLOGY BASED ON THE SILICON-IMPLANT-OXIDE (SIMOX)

FISCAL YEAR 1986

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PROCESS. THE MAJOR TASKS FOR PHASE I ARE: ANALYSIS AND MODELING OF COMPLEMENTARY JFET (CJFET) DEVICES AND CIRCUITS.		
ELECTRO-OPTEK CORP 23887 MADISON ST TORRANCE, CA 90505 WILLIAM S CHAN, PHD TITLE: PASSIVELY COOLED InSb DETECTOR ARRAYS T 3 OFFICE:	SDIO	\$107,729

A PASSIVELY-COOLED DETECTOR ARRAY TECHNOLOGY IN THE MID WAVELENGTH INFRARED (MWIR) REGION IS BEING SOUGHT FOR SPACEBORNE SURVEILLANCE APPLICATIONS. WE HAVE PROPOSED TO USE THE MOLECULAR BEAM EPITAXY (MBE) TECHNOLOGY TO FABRICATE HIGH-QUALITY InSb MATERIAL AND HIGH-DETECTIVITY DETECTOR ARRAYS. THE RESULTANT ARRAYS, WHEN OPERATED AT TEMPERATURES ACHIEVABLE WITH PASSIVE COOLING WILL HAVE A DETECTIVITY COMPARABLE TO CURRENT DETECTOR OPERATING AT 100K. THE MILESTONES FOR PHASE I OF A THREE-PHASE PROGRAM ANALYSIS, DESIGN AND DEFINITION OF THE MBE PROCESSES TO ESTABLISH HIGH-QUALITY InSb EPITAXIAL LAYERS ON SUITABLE MWIR TRANSPARENT SUBSTRATES SUITABLE FOR FLIP-CHIP HYBRID ARRAY FABRICATION.

ELECTROCHIMICA CORP 20 KELLY CT MENLO PARK, CA 94025 DR M EISENBERG TITLE: ADVANCED TECHNOLOGY RECHARGEABLE LITHIUM BATTERIES FOR SMALL UNITS T 9 OFFICE: DARPA	DARPA	\$ 49,498
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A POWERFUL APPROACH TO RECHARGEABLE AMBIENT TEMPERATURE ORGANIC LITHIUM BATTERIES OF LIMITED CYCLE LIFE IS PROPOSED WHICH EMPLOYS METAL HALIDES AS REDUCIBLE CATHODES, WHICH WOULD BE DEVELOPED TO REPLACE Li-SO(2) PRIMARY CELLS CURRENTLY SUED BY THE ARMY FOR SMALL UNITS. THIS APPROACH TO HIGH ENERGY BATTERIES IS PARTICULARLY APPROPRIATE FOR SAFE OPERATION AT A HIGH RATE OF DISCHARGE FOR THE DURATION OF A LIMITED CYCLE LIFE OF 50 CYCLES, AS REQUIRED FOR MANY MILITARY APPLICATIONS. THE APPROACH IS BASED ON INITIAL VERY PROMISING RESULTS OBTAINED AT ELECTROCHIMICA CORP. IN AN IN-HOUSE

FISCAL YEAR 1986

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SPONSORED PROGRAM. SUCCESSFUL PERFORMANCE OF REDUCIBLE CATHODS IS DEPENDENT ON ELECTROLYTE-ELECTRODE INTERACTIONS, ESPECIALLY SOLUBILITY OF THE CATHODE SPECIES. TWO METAL HALIDES ARE PROPOSED FOR LITHIUM CELLS, WITH THEORETICAL ENERGY DENSITIES AS HIGH AS 363 Wh/£. EXPERIMENTAL STUDIES WILL CONCENTRATE ON CONSTRUCTION OF ELECTRO-CHEMICAL TEST CELLS CAPABLE OF SUPPORTING HIGH RATE DISCHARGES (1 HR) AT CURRENT DENSITIES OF 2-5 mA/cm<sup>2</sup> AS WELL AS PRELIMINARY DESIGN AND CONSTRUCTION OF SEALED CYLINDRICAL CELLS CONTAINING A SAFETY OVER-CHARGE MECHANISM. CELLS WILL BE EVALUATED FOR DISCHARGE CAPACITIES AND ENERGY DENSITIES AS A FUNCTION OF CYCLE LIFE.

ELECTROCHIMICA CORP 20 KELLY CT MENLO PARK, CA 94025 DR M EISENBERG TITLE: IMPROVED SMALL BATTERIES - HIGH POWER METAL OXIDE - ALUMINUM UNITS T 262 OFFICE: BMO/MYSC	AF	\$ 49,498
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A VERY HIGH POWER DENSITY METAL OXIDE-ALUMINUM ELECTROCHEMICAL BATTERY SYSTEM IS PROPOSED FOR INVESTIGATION IN THE PHASE I PROGRAM AS A BASIS FOR FUTURE DEVELOPMENT OF SMALL BATTERIES (OF A WEIGHT LESS THAN ONE POUND) FOR APPLICATIONS IN ROCKET LAUNCH, SPACE, AND RE-ENTRY ENVIRONMENTS. THIS IS A LOW RISK DEVELOPMENT APPROACH SINCE THE INDIVIDUAL ELECTRODES ARE KNOWN IN OTHER BATTERY SYSTEMS. THE COUPLE COMBINATION AND DESIGN APPROACH ARE NEW. A PRELIMINARY DESIGN ANALYSIS WAS CARRIED OUT FOR A 25 v. 1000 WATT UNIT (40 A PEAKS AT A 20% DUTY CYCLE). THE RESULTS INDICATED THAT WITH REASONABLE (FOR THIS HIGH RATE SYSTEM CURRENT DENSITY OF 200 mA/cm<sup>2</sup>) THE BATTERY, WITH A MAXIMUM SIZE OF 13.6 cu. in, AND A WEIGHT OF 313 g (0.69 POUND) COULD PROVIDE A VERY HIGH PEAK POWER DENSITY OF 3195 W/kg (1450 W/£) AND ALSO A VERY ATTRACTIVE HIGH ENERGY DENSITY. IN PHASE I THE CATHODE WILL BE EVALUATED UNDER RELAVENT CONDITIONS, THE ANODE FARADAIC EFFICIENCY DETERMINED AND AN INITIAL CELL CONSTRUCED AND STUDIED UNDER PULSE DISCHARGE CONTITION.

ELECTROMAGNETIC SCIENCES INC 125 TECHNOLOGY PK/ATLANTA NORCROSS, GA 30092 DR JAMES A FULLER TITLE: MILLIMETER-WAVE PHASED ARRAY T 78 OFFICE: LABCOM/ETDL	ARMY	\$ 49,833
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THE SELLER PROPOSES TO INVESTIGATE A NOVEL TECHNIQUE WHICH WOULD

FISCAL YEAR 1986

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ALLOW THE REALIZATION OF A COMPACT, LOW COST, ONE DIMENSION SCANNED PHASED ARRAY WITH BROADBAND, MILLIMETERWAVE, DUAL-POLARIZATION CAPABILITY SUCH AS MIGHT BE REQUIRED IN ELECTRONIC WARFARE POLARIMETRIC RADAR, SEEKER AND ELINT APPLICATIONS. PREVIOUS DATA IS PROVIDED TO SHOW PERFORMANCE ALREADY OBTAINED BY A SIMILAR UNIT IN A FREQUENCY SCALED VERSION. THE WORK PROPOSED UNDER PHASE I WILL RESULT IN THE DESIGN OF THE DUAL-POLARIZED, BROADBAND RADIATING ELEMENT AND IN THE DEVELOPMENT OF MECHANICAL PACKAGING CONFIGURATIONS FOR COMPLETE PLANAR ARRAYS THAT PROVIDE ELECTRONIC SCAN IN ONE DIMENSION. DURING PHASE I IT IS EXPECTED THAT MOST FEASIBILITY EXPERIMENTS REQUIRING COMPONENTS ARE ALREADY AVAILABLE AND WHERE FABRICATION COSTS ARE LOWER. DURING PHASE II THE DEVELOPMENT OF A FULLY OPERATIONAL MILLI-METER-WAVE PHASED ARRAY ANTENNA IS ANTICIPATED. THIS ARRAY WILL IMPLEMENT THE ELEMENT DESIGN AND ONE OF THE ARRAY PACKAGING CONFIGURATIONS DEVELOPED DURING PHASE I.

ELECTRONIC DECISIONS, INC

SDIO

\$ 50,000

1114 WEST SPRINGFIELD

URBANA, IL 61801

DANIEL A FLEISCH, PHD

TITLE:

IR FOCAL PLANE ARRAY MULTIPLEXING - NEW APPROACH

T

3

OFFICE:

AN IMPORTANT PROBLEM IN THE AREA OF IR FOCAL PLANE ARRAY IMAGING IS THE FAST AND EFFICIENT MULTIPLEXING AND PROCESSING OF THE SIGNALS FROM THE DETECTOR ARRAY. A NEW APPROACH TO THIS PROBLEM UTILIZING THE RECENTLY DEVELOPED ACOUSTIC CHARGE TRANSPORT (ACT) DEVICE IS PRESENTED. THE ACT DEVICE COMBINES SURFACE ACOUSTIC WAVE AND CHARGE TRANSPORT TECHNOLOGIES TO ACHIEVE A LOW-NOISE, HIGH-THROUGHPUT MULTIPLEXER IMPLEMENTED IN GALLIUM ARSENIDE WHICH OFFERS THE POTENTIAL FOR ADDITIONAL ON-PLANE PROCESSING. THE PROPOSED PROGRAM USES AN EXISTING ACT DEVICE TO DEMONSTRATE AND EVALUATE THE ACT MULTIPLEXER. THIS DEVICE WILL BE OPERATED AT CRYOGENIC TEMPERATURES USING VISIBLE LIGHT AT THE INPUTS TO SIMULATE AN IR DETECTOR ARRAY. EXPERIMENTAL MEASUREMENTS OF FUNDAMENTAL PERFORMANCE PARAMETERS SUCH AS NOISE LEVEL, CHARGE CAPACITY, AND PIXEL-TO-PIXEL UNIFORMITY WILL BE MADE AND COMPARED TO THEORY. THE RESULTS WILL BE EXTRAPOLATED ANALYTICALLY TO PROJECT THE PERFORMANCE OF AN OPERATIONAL ACT IR FOCAL PLANE ARRAY MULTIPLEXER.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
ELECTROSYNTHESIS CO INC PO BOX 16 EAST AMHERST, NY 14051 DR NORMAN L WEINBERG TITLE: HINDERED ALIPHATIC AMINES SYNTHESIS T 109 OFFICE: NSWC	NAVY	\$ 49,932

THE SYNTHESIS OF FOUR STERICALLY HINDERED ALIPHATIC DIAMINES BY CHEMICAL AND ELECTROCHEMICAL METHODS IS PROPOSED. THESE PRODUCTS MAY FIND USE AS CURING AGENTS FOR EPOXY RESINS WITH UNIQUE MECHANICAL PROPERTIES. THE SYNTHETIC APPROACHES ARE BASED ON WELL-FOUNDED CHEMICAL PRINCIPLES, AND THE DESIRED COMPOUNDS WILL BE PROVIDED IN HIGH YIELD AND PURITY, EASILY SEPARABLE FROM ALL OTHER REACTION INTERMEDIATES. THE METHODS DEVELOPED WILL UTILIZE INEXPENSIVE REAGENTS, AND CAN BE READILY SCALED UP TO PRODUCE LARGE QUANTITIES OF MATERIAL. PHASE II WILL EXTEND THESE STUDIES TO CREATE A SERIES OF MORE HIGHLY-FUNCTIONALIZED AMINES THAT MAY HAVE SUPERIOR PROPERTIES TO THOSE INITIALLY PROPOSED.

ELECTROSYNTHESIS CO INC PO BOX 16 EAST AMHERST, NY 14051 DR NORMAN L WEINBERG TITLE: SURFACE MODIFIED CARBON ELECTRODES FOR LITHIUM OXYHALIDE BATTERIES T 177 OFFICE: AFWAL/PO	AF	\$ 68,482
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THE CARBON ELECTRODES IS AN INTEGRAL COMPONENT OF THE HIGH ENERGY DENSITY Li/SOCl<sub>2</sub> AND Li/SO<sub>2</sub>Cl<sub>2</sub> PRIMARY BATTERY SYSTEMS. RATE CAPABILITY AND POLARIZATION BEHAVIOR OF THE ELECTRODE IS EXPECTED TO BE ENHANCED BY SPECIFIC PRETREATMENTS OF THE CARBON. FACTORS INFLUENCING THE CARBON'S PERFORMANCE ARE SURFACE AREA, POROSITY AND PORE SIZE DISTRIBUTION, THERMAL AND ELECTRICAL CONDUCTIVITY, AND WETTABILITY BY THE OXYHALIDE AND ELECTROLYTE. THIS PROPOSAL ADDRESSES SPECIFIC CHEMICAL SURFACE TREATMENTS OF PARTICULAR CARBONS AFFECTING THE RATE PERFORMANCE, SPECIFIC CAPACITY AND SHELF-LIFE OF THE BATTERY. THE GOAL IS A DELIVERABLE BATTERY CAPABLE OF PROVIDING OVER 400 WATT-HOURS/POUND OR 25 WATT HOURS/CUBIC INCH AT THE 100 HOUR RATE OR SLOWER DISCHARGES, AS WELL AS A SIGNIFICANT INCREASE IN STORAGE CAPABILITY.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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ELTRON RESEARCH, INC  
4260 WESTBROOK DR  
AURORA, IL 60505  
ANTHONY F SAMMELLS

SDIO

\$ 49,991

## TITLE:

ADVANCED HIGH VOLTAGE LIQUID JUNCTION CELL FOR NON-NUCLEAR SPACE  
POWER

T 5 OFFICE:

THE PROPOSED PROGRAM IS DIRECTED TOWARDS EVALUATING THE TECHNICAL FEASIBILITY OF A TWO PHOTOELECTRODE HIGH-VOLTAGE LIQUID-JUNCTION PHOTOELECTROCHEMICAL (PEC) CELL USING p-InP AS A PHOTOCATHODE AND n-CdS OR CdSe AS PHOTOANODES. A REGENERATIVE POLYSULFIDE ELECTROLYTE WILL BE PRESENT BETWEEN THE TWO PHOTOELECTRODES. ELECTROCATALYSIS ACROSS THE LIQUID-JUNCTION WILL BE PROMOTED BY INTRODUCING THIO-SPINELS ONTO EACH PHOTOELECTRODE. PROGRAM EMPHASIS WILL BE ON SINGLE CRYSTAL PHOTOELECTRODES, ALTHOUGH SOME WORK WILL BE PERFORMED USING POLYCRYSTALLINE CADMIUM CHALCOGENIDES. TECHNIQUES TO BE USED FOR INVESTIGATING THE LIQUID-JUNCTION REGION OF THESE PHOTOELECTRODES WILL INCLUDE, STEADY-STATE AND TRANSIENT ELECTROCHEMICAL MEASUREMENTS. TRANSIENT LASER-PULSE TECHNIQUES WILL ALSO BE USED TO EXAMINE THE ROLE OF SURFACE MODIFICATION PROCEDURES FOR ENHANCING OR SUPPRESSING MINORITY CARRIER RECOMBINATION SITES. THE TWO PHOTOELECTRODE CELL TO BE CHARACTERIZED DURING PHASE I WILL EVOLVE INTO A DEVICE IN THE COURSE OF PHASE II USING POLYCRYSTALLINE PHOTOELECTRODES AND INTEGRATED, BY A NOVEL BIPOLAR ARRANGEMENT, WITH ELECTROCHEMICAL ENERGY STORAGE.

ENERGY APPLICATIONS & SYSTEMS, INC  
1104 CAMINO DEL MAR  
DEL MAR, CA 92014  
S LOCKE BOGART

SDIO

\$ 91,530

## TITLE:

CARTRIDGE CONCEPT FOR SDI WEAPONS PLATFORMS - FEASIBILITY  
ANALYSIS

T 4 OFFICE:

THE STRATEGIC DEFENSE INITIATIVE OFFICE SEEKS INNOVATIVE APPROACHES  
FOR THE PROVISION OF THE POWER AND ENERGY REQUIRED TO OPERATE DIF-



FISCAL YEAR 1986

SUBMITTED BY

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FERENT SDI WEAPONS SYSTEMS. IT IS IMPORTANT TO NOTE THAT MOST OF THESE WEAPONS SYSTEMS ARE BASED ON ELECTRICITY, PURE WORK OR ENERGY WITH "AVAILABILITY" EQUAL TO UNITY IN THE THERMODYNAMIC SENSE. ENERGY APPLICATIONS & SYSTEMS INC. HAS CONCEIVED A "NUCLEAR CART-RIDGE" THAT COULD PROVIDE THE PURE WORK NEEDED FOR KEW SYSTEMS AND WHICH MAY BE SUITABLE FOR DEW SYSTEMS AS WELL. THE NUCLEAR CART-RIDGE IS A RELATIVELY SMALL SUBCRITICAL DEVICE THAT IS "FIRED" BY A SURROUNDING PULSED ANNULAR REACTOR THAT IS DESIGNED FOR HIGH THERMAL NEUTRON FLUENCE PER PULSE. THE ENERGY OUTPUT OF THE CARTRIDGE IS IN THE FORM OF A HIGH TEMPERATURE, PARTIALLY IONIZED LOW MOLECULAR WEIGHT EXHAUST GAS THAT WOULD BE USED TO ACCELERATE A MASS OR COULD BE CONVERTED TO ELECTRIC POWER BY SEVERAL METHODS SUCH AS AN MHD CONVERTOR. THE CARTRIDGE IS EXPENDABLE, SIMILAR TO MUCH LARGER CRITICAL ASSEMBLIES, BUT IS FAR EASIER TO HANDLE AND CAN BE DESIGNED FOR A BROAD RANGE OF ENERGY LEVELS (WHICH IS NOT EASILY DONE FOR A CRITICAL ASSEMBLY). A TYPICAL CARTRIDGE, RATED AT 5 MJ, WOULD CONTAIN ABOUT 100 gm OF U-235 AND 1.2 kg OF LiH. TYPICAL DIMENSIONS OF THE OVERALL ASSEMBLY WOULD BE ABOUT 9 cm (3.5") IN DIAMETER, 40 cm (16") IN LENGTH AND IT WOULD MASS LESS THAN 2 kg (4.4 lbm).

ENERGY CONVERSION DEVICES INC

AF

\$ 50,000

1675 W MAPLE RD

TROY, MI 48084

DAVID STRAND

TITLE:

PHASE CHANGE ERASABLE OPTICAL DATA STORAGE MEDIA QUANTIFICATION

T 50

OFFICE: RADC/XPX

ECD INVENTED AND DEVELOPED THE CONCEPT OF USING A STRUCTURAL CHANGE IN A MATERIAL TO STORE INFORMATION. USING SEMICONDUCTOR DIODE LASERS TO RECORD, READ, AND ERASE INFORMATION ON PHASE CHANGE MEDIA OFFERS THE OPPORTUNITY TO HAVE A PRODUCT WITH THE FEATURES OF MAGNETIC STORAGE MEDIA WITH GREATLY INCREASED STORAGE CAPACITY. THIS PROPOSAL IS DESIGNED TO DEMONSTRATE THE FEASIBILITY OF PHASE CHANGE MATERIALS FOR THIS APPLICATION BY QUANTIFYING THEIR PERFORMANCE IN THE AREAS OF SENSITIVITY, SPEED, DATA CAPACITY, DATA TRANSFER RATES, CARRY TO NOISE RATIO AND OTHERS. THE PERFORMANCE IS COMPARED TO DESIRED LEVELS TO DETERMINE SUITABILITY FOR THIS APPLICATION.

ENERGY CONVERSION DEVICES, INC

SDIO

\$ 99,571

1675 W MAPLE RD

TROY, MI 48084

JOSEPH HANAK, PHD

TITLE:

ADVANCED HIGH ENERGY ULTRALIGHT PHOTOVOLTAIC ARRAY FOR NON-NUCLEAR SPACE POWER

T 5

OFFICE:

THE GENERAL OBJECTIVE OF THIS PROPOSAL IS TO DEVELOP NON-NUCLEAR,

FISCAL YEAR 1986

SUBMITTED BY

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HIGH ENERGY DENSITY ENABLING TECHNOLOGY FOR A NEW KIND OF ADVANCED SOLAR HIGH-POWER PHOTOVOLTAIC (PV) ARRAYS FOR SPACE APPLICATIONS. THE SPECIFIC OBJECTIVE IS TO FABRICATE AN ULTRALIGHT, FLEXIBLE, pv ARRAY UTILIZING AMORPHOUS SILICON ALLOY THIN FILM SOLAR CELLS AND CAPABLE OF GENERATING ELECTRIC POWER AT 300 V DC, A PROTOTYPE OF ARRAYS THAT WILL BE REQUIRED IN FUTURE, HIGH-POWER, SPACE POWER SYSTEMS. THE CONSTRUCTION OF THE ARRAY WILL BE SUCH AS TO PREVENT LEAKAGE AND ARCING. THE ARRAY WILL BE OF SUFFICIENT SIZE (1-2 M SQUARE AND CAPABLE OF DELIVERING SIGNIFICANT POWER (50-100 W AT AM1) TO PROVIDE EVIDENCE OF SCALABILITY TO LARGE SYSTEMS. THE APPROACH WILL CONSIST OF THE STEPS OF PRODUCING TANDEM-JUNCTION, SINGLE-GAP, a-Si ALLOY SOLAR CELLS IN EXISTING ROLL-TO-ROLL DEPOSITION PROCESSES, FABRICATION OF MONOLITHIC MODULES, INTERCONNECTING THEM INTO A HIGH-VOLTAGE ARRAY, ENCAPSULATING IT AND TESTING ITS PV PERFORMANCE AND PROTECTION AGAINST LEAKAGE AND ARCING AT HIGH VOLTAGES.

ENERGY INNOVATIONS INC  
320 S HARRISON ST  
EAST ORANGE, NJ 07018  
DR MEREDITH C GOURDINE

DARPA

\$ 47,300

TITLE:

THIN-FILM SOLID-STATE CELLS WITH 2 INORGANIC COMPONENTS

T 9 OFFICE: DARPA

THE OBJECTIVE OF THIS PHASE I RESEARCH IS TO INVESTIGATE THE FEASIBILITY OF BUILDING TWO COMPONENT THERMOVOLTAIC CELLS AND BATTERIES. SUCH THIN-FILM SOLID-STATE CELLS CAN BE CHARGED BY AN EXTERNAL POWER SUPPLY, THEN, DISCHARGE THROUGH AN EXTERNAL RESISTANCE WITH HIGH SPECIFIC POWER AND SPECIFIC STORED ENERGY. THERE ARE NO SIDE REACTIONS SO CHARGE-DISCHARGE CYCLES CAN BE REPEATED RAPIDLY AND FOR AN INDEFINITE NUMBER OF CYCLES. THE APPROACH IS TO BUILD SINGLE CELLS AND STUDY THEIR ELECTRICAL CHARACTERISTICS AS A FUNCTION OF TEMPERATURE AND HUMIDITY. THEN, BUILD BATTERIES CONSISTING OF STACKS OF SUCH CELLS IN PARALLEL, AND DETERMINE THE CHARGE/DISCHARGE CHARACTERISTICS OF SUCH BATTERIES. FINALLY, BUILD STACKS OF SUCH BATTERIES CONNECTED IN SERIES TO OBTAIN HIGHER VOLTAGES, AND INVESTIGATE THE THERMAL CHARACTERISTICS OF SUCH BATTERIES INSIDE OF A THERMAL ENCLOSURE, WITH OR WITHOUT HUMIDITY.

ENERGY MATERIALS RESEARCH CO  
2547 EIGHTH ST  
BERKELEY, CA 94710  
JOHN BROOKES

SDIO

\$ 75,209

TITLE:

FLEXIBLE CERAMIC COMPOSITES BY VACUUM PLASMA ARC DEPOSITION

T 11 OFFICE:

THE PROPOSED WORK IS TO DEVELOP A NEW CLASS OF HIGH PERFORMANCE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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CERAMIC COATINGS AND ARTICLES BY MEANS OF PLASMA DEPOSITION. THE VACUUM PROCESS YIELDS SMALL PARTICLES WHICH ARE THEN JOINED TOGETHER IN THE ULTIMATE PRODUCT WITH IONIC AND COVALENT BONDS. BECAUSE OF THE CONTROL OVER PARTICLE GEOMETRY, THE CERAMIC WILL BE FLEXIBLE, MALLEABLE, AND ROOM TEMPERATURE CASTABLE. OPTICAL AND ELECTRONIC PROPERTIES ARE CONTROLLABLE OVER A WIDE RANGE. PROJECTED PROPERTIES FOR THIS STUDY ARE 250 MN m(-2) TENSILE STRENGTH, MODULI OF 25 GN m(-2), AND 10% ELONGATION. XPS AND SIMS ANALYSES WILL BE PERFORMED TO DETERMINE SURFACE BONDING AND DEPTH PROFILING.

ENERGY OPTICS INC PO BOX 15052 - 224 N CAMPO ST LAS CRUCES, NM 88004 JOHN H STOKES TITLE: GASEOUS TRITIUM LIGHT SOURCE T 130 OFFICE: NWC/NAVAIR	NAVY	\$ 47,053
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THIS PROGRAM IS ORGANIZED TO DEMONSTRATE THE FEASIBILITY OF USING A GASEOUS TRITIUM LIGHT SOURCE (GTLS) AS A SELF POWERED DEVICE TO PROVIDE CONTINUOUS ILLUMINATION INSIDE A ROCKET MOTOR ARM-FIRE DEVICE FOR A PERIOD OF 15 YEARS. THE SOURCE WILL ILLUMINATE SAFE/ARMED (S/A) SYMBOLS WITH COLOR CODED LIGHT. AN IMAGE QUALITY FIBER OPTIC BUNDLE WILL ALLOW THE IMAGE OF THE INDICATOR TO BE OBSERVED BY JORDINANCE PERSONNEL IN VERY LOW LIGHT CONDITIONS. THE IMPORTANT OBJECTIVES OF PHASE I ARE TO INVESTIGATE DESIGN ALTERNATIVES, TO FABRICATE A DEMONSTRATION PROTOTYPE SYSTEM AND TO DESIGN THE FINAL PRODUCT. IF THE PHASE I PROGRAM IS SUCCESSFUL, IT WILL ALLOW ADVANCED DEVELOPMENT AND MANUFACTURING OF A LIMITED QUANTITY OF INDICATOR SYSTEMS IN PHASE II FOR FIELD TESTING.

ENERGY OPTICS INC PO BOX 15052 - 224 N CAMPO ST LAS CRUCES, NM 88004 STEVEN M WARD TITLE: RANGE DETERMINATION BY OPTICAL TRIANGULATION T 65 OFFICE: NAVSEA	NAVY	\$ 57,429
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THIS PROGRAM IS ORGANIZED TO DEMONSTRATE THE FEASIBILITY OF A LOW

FISCAL YEAR 1986

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COST, OPTICAL TRIANGULATION TECHNIQUE FOR SENSING THE RANGE OF OBSTACLES AND DEPRESSIONS IN THE PATH OF A MOBILE ROBOT. THE PROPOSED APPROACH, WHICH IS LABELED RANGE DETERMINATION BY OPTICAL TRIANGULATION (RDOT), IS EXPECTED TO PRODUCE A SMALL RANGEFINDING MODULE WHICH HAS NO MOVING PARTS. MULTIPLE MODULES CAN BE INTERFACED TO A STANDARD MICROCOMPUTER BUS FOR SENSING RANGE IN SEVERAL DIRECTIONS. EXPECTED ADVANTAGES INCLUDE LOW UNIT COST, FAST RESPONSE AND RELIABLE OPERATION. THE IMPORTANT PHASE I OBJECTIVES ARE TO INVESTIGATE ANALOG AND DIGITAL DESIGN ALTERNATIVES AND TO SELECT A SINGLE APPROACH FOR PROTOTYPE DEVELOPMENT AND DEMONSTRATION. PHASE I WORK IS ORGANIZED IN A SYSTEMATIC APPROACH TO SUPPORT ADVANCED PRODUCT DEVELOPMENT IN PHASE II.

ENERGY SCIENCE LABS., INC. 11404 SORRENTO VALLEY RD., SUITE 112 SAN DIEGO, CA 92121 JOSEPH A. CARROLL	SDIO	\$ 69,661
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## TITLE:

CHARACTERIZATION OF A NEW STRUCTURAL MATERIAL FOR LOW COST LAUNCH VEHICLES

T 12 OFFICE:

THIS PROJECT WILL INVESTIGATE A NEW STRUCTURAL MATERIAL THAT APPEARS TO HAVE A NOVEL COMBINATION OF PROPERTIES SUITED TO LAUNCH VEHICLE APPLICATIONS. IN ADDITION, INITIAL WORK WITH THE MATERIAL INDICATES THAT IT SHOULD LEND ITSELF TO LOW-COST FABRICATION TECHNIQUES. WE WILL FIRST CHARACTERIZE THE MATERIAL ITSELF, WITH THE AIM OF IDENTIFYING IDIOSYNCRASIES THAT MAY LIMIT ITS RANGE OF APPLICATION. NEXT WE WILL EXPLORE SIMPLE FABRICATION TECHNIQUES AND SELECT THOSE WHICH SEEM MOST LIKELY TO ALLOW LOW-COST FABRICATION OF MAJOR COMPONENTS SUCH AS PROPELLANT TANKS. THEN WE WILL BUILD SOME SMALL PRESSURE VESSELS TO PROVE OUT THE FABRICATION TECHNIQUES, AND TEST THE VESSELS TO FIND THEIR BURST STRENGTH. FINALLY, WE WILL LOOK FOR SYSTEMS IMPLICATIONS THAT THE MATERIAL MAY HAVE ON LAUNCH VEHICLE DESIGN, SUGGEST SUITABLE VEHICLE CONFIGURATIONS, AND ESTIMATE THEIR POTENTIAL PERFORMANCE.

ENERGY SCIENCE LABS., INC 11404 SORRENTO VALLEY RD., SUITE 112 SAN DIEGO, CA 92121 GEORGE W WEBB	SDIO	\$ 68,435
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## TITLE:

MINIATURE CONDUCTORS FOR SENSORS

T 3 OFFICE:

WE DESCRIBE A FOUR PART RESEARCH PROGRAM INTO THE PREPARATION OF

FISCAL YEAR 1986

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THIN FREE-STANDING CONDUCTORS, THEIR SUBSEQUENT MANIPULATION, THEIR CHARACTERIZATION, AND THEIR EVALUATION FOR DEVICE APPLICATIONS. CONDUCTOR DIMENSIONS ARE MADE AS SMALL AS POSSIBLE IN ORDER TO MINIMIZE RESPONSE TIME TO CHANGING THERMAL STIMULI AND TO INCREASE SENSITIVITY. THE LOADING OF THE CONDUCTORS TAKES PLACE IN A SCANNING ELECTRON MICROSCOPE, MODIFIED TO ALLOW FOR THEIR MANIPULATION. SAMPLE CHARACTERIZATION INCLUDES CHEMICAL ANALYSIS AND MEASUREMENT OF ELECTRICAL CONDUCTIVITY. THE MATERIALS WILL BE CRITICALLY EVALUATED AS COMPONENTS IN DEVICES.

ENTECH, INC P.O. BOX 612246 DAL-FT. WOR. ARPT, TX 75261 MARK J O'NEILL TITLE: DOME FRESNEL LENS/GALLIUM ARSENIDE PHOTOVOLTAIC CONCENTRATOR ARRAY WITH AN AMO OPERATIONAL ARRAY EFFICIENCY GREATER THAN 20% T 5 OFFICE:	SDIO	\$ 49,936
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ENTECH IS PLEASED TO PROPOSE TO THE STRATEGIC DEFENSE INITIATIVE ORGANIZATION THE DESIGN DEVELOPMENT OF AN INNOVATIVE DOME FRESNEL LENS/GALLIUM ARSENIDE PHOTOVOLTAIC CONCENTRATOR ARRAY, CAPABLE OF ACHIEVING AN AMO OPERATIONAL ARRAY EFFICIENCY OF 20.4% IN THE SPACE ENVIRONMENT. THE PROPOSED SYSTEM WILL UTILIZE THREE HIGHLY INNOVATIVE FEATURES: (i) A DOME FRESNEL LENS CONCENTRATOR WHICH WILL PROVIDE 95% OPTICAL EFFICIENCY AT 100X CONCENTRATION; (ii) A PRISMATIC CELL COVER WHICH WILL MINIMIZE CELL FRONT SURFACE REFLECTION LOSSES AND ELIMINATE GRIDLINE OBSCURATION LOSSES; AND (iii) STATE-OF-THE-ART GALLIUM ARSENIDE CONCENTRATOR CELLS WHICH WILL PROVIDE 23.3% OPERATIONAL CELL EFFICIENCY. THESE THREE INNOVATIVE FEATURES WILL BE INTEGRATED INTO AN ARRAY CONFIGURATION WHICH WILL PROVIDE AN AMO OPERATIONAL POWER OUTPUT OF 275 WATTS PER SQUARE METER OF ARRAY AREA, ABOUT TWICE AS HIGH AS FOR CURRENT PLANAR SILICON PHOTOVOLTAIC ARRAYS AND ABOUT ONE AND ONE-HALF TIMES HIGHER THAN THE MOST PROMISING REFLECTIVE CONCENTRATOR ARRAY. THE INCREASED PERFORMANCE LEVEL WILL DRAMATICALLY REDUCE ARRAY AREA, ARRAY MASS, AND ARRAY COST FOR FUTURE SPACE POWER SYSTEMS. BASED ON OUR PAST NINE YEARS OF SUCCESSFULLY DEVELOPING THE NEW ARRAY DESIGN.

EPITEK CORP 76 HOLTON ST WOBURN, MA 01801 PAUL VOHL TITLE: PHASE I EPITAXY OF MERCURY CADMIUM TELLURIDE HETEROSTRUCTURES 151 OFFICE: AFWAL/ML	AF	\$ 45,900
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PHASE I IS TO DEMONSTRATE AN ADVANCED TECHNIQUE FOR THE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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GROWTH OF MULTILAYERS OF MERCURY CADMIUM TELLURIDE (MCT) AT LOW TEMPERATURE (<350 DEG C) FOR IR DETECTOR APPLICATIONS. THE OBJECTIVES ARE TO OBTAIN: 1) GROWTH OF UNIFORM LARGE AREA DEVICE QUALITY LAYERS AT LOW TEMPERATURE. 2) MULTILAYER STRUCTURES INCLUDING N/P JUNCTIONS. THE LAYERS ARE GROWN BY A NEW VAPOR-PHASE METHOD WHICH YIELDS COMPOSITIONS COVERING THE ENTIRE ALLOY RANGE BETWEEN HgTe AND CdTe. INDEPENDENT CONTROL OF THE FOUR PRINCIPAL PARAMETERS THAT DETERMINE THE COMPOSITION; THE SUBSTRATE TEMPERATURE AND THE PARTIAL PRESSURES OF Hg, Cd AND Te IS ACHIEVED IN AN OPEN-TUBE SYSTEM THAT UTILIZES SEPARATE ELEMENTAL SOURCES. THE GROWTH OF DEVICE QUALITY EPILAYERS INCLUDING LAYERS SUITABLE FOR RESONANT OPTICAL CAVITY (ROC) APPLICATIONS, HAS ALREADY BEEN DEMONSTRATED. ANTICIPATED BENEFITS ARE: 1) THE PROCESS CAN MEET THE REQUIREMENTS OF COST EFFECTIVE PRODUCTION AND SAFETY AND 2) THE REACTOR IS OF SIMPLE CONSTRUCTION AND UTILIZES THE ELEMENTS DIRECTLY. THE REACTOR IS PRESENTLY IN OPERATION AND INITIAL RESULTS INDICATE THAT THE OBJECTIVES CAN BE REALIZED.

EPOCH ENGINEERING INC  
806 W DIAMOND AVE  
GAITHERSBURG, MD 20878  
E H BEACH  
TITLE:

NAVY \$ 45,206

IMPROVED SWITCHING CONCEPTS FOR S-A DEVICES  
T 133 OFFICE: NWC/NAVSEA

A PRINCIPAL PROBLEM IN THE DESIGN OF SAFE-ARM DEVICES FOR ANY MUNITION IS TO INSURE THAT WHEN IN SAFE POSITION CERTAIN SWITCHES WHICH SHOULD BE CLOSED, REMAIN CLOSED, AND CERTAIN SWITCHES WHICH SHOULD BE OPEN, REMAIN OPEN, WHEN THE MUNITION IS SUBJECTED TO THE VARIOUS ENVIRONMENTS OF SHOCK, VIBRIATION, ELECTROMAGNETIC RADIATION, OR TEMPERATURE EXTREMES THAT MAY BE EXPERIENCED IN THE STOCKPILE-TO-TARGET SEQUENCE. AFTER ARMING, WHEN THESE SWITCHES HAVE BEEN OPERATED, THE SAME CRITERIA SHOULD AGAIN APPLY. MECHANICAL, MAGNETIC, AND OPTICAL TECHNIQUES WILL BE DEVELOPED TO PROVIDE NEW AND NOVEL SOLUTIONS TO THIS PROBLEM.

EPSILON LAMBDA ELECTRONICS CORP  
427 STEVENS ST  
GENEVA, IL 60134  
PETER TOULIOS  
TITLE:

AF \$ 46,036

QUARTZ MICROSTRIP ELECTRONIC SCAN ANTENNA FOR UPPER MILLIMETER WAVE SEEKER APPLICATION  
T 27 OFFICE: AFATL/ASR

THE GUIDANCE OF SMALL MUNITIONS AND MISSILES USING SEEKER FRONT ENDS

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>AT MILLIMETER WAVE LENGTHS HAS GAINES INCREASING DEVELOPMENT ATTENTION. MILLIMETER SEEKERS HAVE ADVANTAGES IN TERMS OF GROUND CLUTTER REJECTION AND OTHER BATTLE FIELD CONDITIONS (SMOKE AND DUST). THE MAJOR PROBLEM PLAGUEING THESE SYSTEMS TO DATE HAS BEEN THE HIGH COST DRIVEN BY THE INABILITY TO INTEGRATE AND MASS PRODUCE. MICROSTRIP CIRCUITRY ON SOFT BOARD SUBSTRATE HAS RELIEVED THE PROBLEM TO SOME EXTENT, BUT ONLY BELOW 40GHZ. THE SCALING OF CIRCUITS ABOVE 40GHZ HAS POSED PROBLEMS BECAUSE OF THE SOFT BOARD MATERIAL USED. Z-CUT QUARTZ CRYSTAL MICROSTRIP TECHNOLOGY, AT PRESENT OFFERS COMMERCIALY AVAILABLE COMPONENTS UP TO 110GHZ. FOR MOST INTEGRATED SEEKER APPLICATIONS COMPONENTS ARE AVAILABLE WITH THE EXCEPTION OF SUITABLE ANTENNAS, PARTICULARLY AN ELECTRONICALLY STEERED ANTENNA WITH APPLICATION FOR USE OVER THE 40 TO 110GHZ MILLIMETER BAND.</p>		

ERGENICS INC 681 LAWLINS RD WYCKOFF, NJ 07481 DR E LEE HUSTON TITLE: COOLING TACTICAL SHELTERS WITH WASTE HEAT T 100 OFFICE: BRDC	ARMY	\$ 72,569
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A NOVEL COOLING SYSTEM FOR TACTICAL SHELTERS IS PROPOSED TO TRANSFORM THE EXHAUST GAS WASTE HEAT FROM THE PRIORITY DIESEL GENERATOR INTO TACTICAL SHELTER AIR CONDITIONING. COOLING IS PROVIDED BY A HEAT PUMP UTILIZING REVERSIBLE METAL HYDRIDE BEDS AND NON-CONDENSIBLE HYDROGEN GAS AS THE WORKING FLUID. THIS NOVEL CONCEPT IS BASED ON ALREADY DEMONSTRATED TECHNOLOGY. FAST RECYCLE REVERSIBLE METAL HYDRIDE COOLING BEDS HAVE ALREADY BEEN DEMONSTRATED BY ERGENICS, INC. R. RFHODES (STRBE/FED, FT. BELVOIR R&D CENTER) HAS SHOWN IN PRELIMINARY WORK THAT WASTE HEAT RECOVERY FROM DIESEL ENGINE EXHAUST IS PRACTICAL. THE PROPOSED HEAT PUMP WILL PROVIDE A WEIGHT REDUCTION AND/OR ADDITIONAL ELECTRIC POWER FOR TACTICAL COMMUNICATION SHELTER. IT WILL HAVE A MINIMUM OF MOVING PARTS AND IS CAPABLE OF HIGH RELIABILITY. A 3000 TO 4000 BTU/hr PROOF-OF-CONCEPT DEVICE WILL BE DESIGNED, FABRICATED AND TESTED IN PHASE I. THIS INFORMATION WILL PROVIDE THE DESIGN INFORMATION FOR THE PHASE II FULL SIZE FIELD TEST UNIT.

ERGO-TECH SYSTEMS INC 6937 ESTEPA DR TUJUNGA, CA 91042 JOSE E CHIRIVELLA TITLE: ACOUSTIC INSTRUMENTATION AND DATA PROCESSING FOR MONITORING THE HOT SECTION OF AIRCRAFT JET ENGINES T 179 OFFICE: AFWAL/PO	AF	\$ 52,006
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ERGO-TECH PROPOSES TO THE U.S. AIR FORCE THE DEVELOPMENT OF AN ON-

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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BOARD INFORMATIONAL SYSTEM TO CONTINUOUSLY MONITOR IN FLIGHT THE PATTERN FACTOR OF THE TURBINE INLET TEMPERATURE (TIT) OF JET ENGINES. THE SYSTEM CONSISTS OF AN ARRAY OF LOW COST RUGGED MINIATURE ACOUSTIC TRANSDUCERS MOUNTED ON THE HOT SECTION ENVELOPE OF THE ENGINE. THE SIGNALS FROM THESE SENSORS ARE INPUT INTO A MICROPROCESSOR WHERE THEY ARE SUBJECT TO A CAREFULLY SELECTED SET OF ALGORITHMS SUCH AS SELECTIVE BAND DIGITAL FILTERING, HIGH ORDER SPACE/TIME CROSS CORRELATIONS, AND NUMERICAL INVERSIONS. THE APPLICATION OF THESE TECHNIQUES RENDERS AN IMAGE OF THE SOURCE DISTRIBUTION OF THE COMBUSTION GENERATED NOISE. THE DISTRIBUTION IS TIGHTLY RELATED TO THE COMBUSTOR PATTERN FACTOR WHICH IS IN TURN THE PRIMARY DRIVER FOR THE DEGRADATION RATE OF THE ENGINE HOT SECTION. THE CONCEPT IS A COMPUTER IMPLEMENTATION OF THE PILOT'S OLD TECHNIQUE OF LISTENING TO HIS ENGINE!

ERGOMETRICS TECHNOLOGY INC 4401 DAYTON-XENIA RD DAYTON, OH 45432 DR CLARK A SHINGLEDECKER TITLE: ENHANCED SUBJECTIVE MEASURES OF OPERATOR WORKLOAD T 164 OFFICE: TECOM/WSMR	ARMY	\$ 63,148
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THE GENERAL GOAL OF THIS EFFORT IS TO EXPLORE TECHNIQUES WHICH CAN BE USED TO IMPROVE THE RELIABILITY, QUANTIFICATION, STANDARDIZATION AND USABILITY OF SUBJECTIVE RATING AND SCALING METHODS FOR WORKLOAD ASSESSMENT. PHASE I OF THE PROJECT IS AIMED AT THE DEVELOPMENT OF A STANDARD BEHAVIORAL ANCHORING METHOD FOR SUBJECTIVE WORKLOAD SCALES. THIS METHOD WOULD INVOLVE THE DERIVATION OF SCALE WEIGHTING FACTORS OR PSYCHOPHYSICAL ANCHORING PROCEDURES BASED ON AN OPERATOR'S WORKLOAD RATINGS OF ONE OR MORE STANDARD ANCHOR TASKS. THE FACTORS WOULD BE USED TO ADJUST WORKLOAD RATINGS OF THE SYSTEM OR TASK UNDER EXAMINATION IN ORDER TO REDUCE THE CONFOUNDING EFFECTS OF INDIVIDUAL DIFFERENCES IN PERFORMANCE CAPACITY AND OF VARIATIONS IN SCALE INTERPRETATION. THE FUNCTIONAL RESULT OF DERIVING AND APPLYING SUCH A STANDARD SCHEME WOULD BE ENHANCED RELIABILITY OF SUBJECTIVE WORKLOAD RATINGS, MORE EFFICIENT USE OF SMALL NUMBERS OF TEST AND EVALUATION PERSONNEL, AND AN UNPRECEDENTED CAPABILITY TO COMPARE WORKLOAD LEVELS ACROSS DISSIMILIAR SYSTEMS.

ESSEX CORP 1040 WOODCOCK RD - STE 227 ORLANDO, FL 32803 ROBERT S KENNEDY TITLE: PERFORMANCE RECKONING FOR PROJECTING MANPOWER AND SKILL LEVEL REQUIREMENTS T 224 OFFICE: ARI/PERI	ARMY	\$ 0
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FISCAL YEAR 1986

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BETWEEN SIGNIFICANT PEOPLE-RELATED ELEMENTS IN MILITARY SYSTEMS AND PERMIT HUMAN RESOURCE MANAGERS TO ANSWER "WHAT IF" QUESTIONS. SINCE THE TECHNIQUE INVOLVES ESTIMATING IN ADVANCE THE LIKELY CONSEQUENCES OF PARTICULAR COMBINATIONS OF PERSONNEL, TRAINING, AND EQUIPMENT FOR MILITARY SYSTEMS PERFORMANCE, IT IS LIKE A FRONT-END ANALYSIS, AND IT BEARS A RESEMBLANCE TO OTHER COMPREHENSIVE APPROACHES SUCHAS MANPRING AND HARDMAN. THE APPROACH MAKES USE OF EXPERT JUDGEMENT IN PREDICT-ING JOB PERFORMANCE WHICH OTHERS AT ARI HAVE USED WITH SUCCESS RE-CENTLY, AND IT PERMITS COST-EFFECTIVENESS STUDIES TO BE PERFORMED WHICH INCORPORATE ALL THREE OF THESE ELEMENTS SIMULTANEOUSLY. THUS FAR, UNDER USAF SPONSORSHIP, A FORMAL ANALYSIS HAS BEEN CONDUCTED OF INFORMATION AVAILABLE FROM THE SCIENTIFIC LITERATURE. THE ANALYSIS REVEALS THE MODEL TO BE VIABLE BUT DATA ARE NOT AVAILABLE IN SUITABLE FORM. WE WOULD LIKE TO TAKE THESE METHODS ONE STEP FURTHER BY PRO-VIDING AN INTERACTIVE EXTENSION TO THE ISOPERFORMANCE MODEL ("PERFORMANCE RECKONING"). TO THIS END WE PROPOSE FURTHER ANALYTIC DEVELPMENT OF THE MODEL, AND CONDUCTION OF A FORMAL EXPERIMENT TO PROVIDE THE NECESSARY DATA TO VALIDATE THE MODEL AND THE MODEL'S ASSUMPTIONS.

EXPERT-EASE SYSTEMS INC  
1301 SHOREWAY RD  
BELMONT, CA 94002  
ROBERT E LARSON

DARPA \$ 49,957

## TITLE:

RECONFIGURABLE DISTRIBUTED COMPUTER SYSTEM FOR ON-BOARD SATELLITE

T 22

OFFICE: DARPA

A PARTICULARLY CHALLENGING AREA FOR THE APPLICATION OF MILITARY COMPUTER SYSTEMS IS THOSE CASES IN WHICH THE SYSTEM MUST OPERATE AUTONOMOUSLY IN A HOSTILE OR REMOTE ENVIRONMENT FOR MANY YEARS. ON-BOARD SATELLITE COMPUTER SYSTEMS ARE A GOOD EXAMPLE OF SUCH AN APPLICATION. THE PROPOSED EFFORT WILL RESULT IN A NEW GENERATION OF RECONFIGURABLE, DISTRIBUTED COMPUTING SYSTEMS WHOSE ARCHITECTURE CAN BE ADAPTED TO BEST FIT THE CURRENT COMPUTING NEEDS. THESE SYSTEMS WILL COMBINE NEW CONCEPTS IN ADAPTIVELY MODIFIED HARDWARE AND SOFT-WARE ARCHITECTURE, TOGETHER WITH NEW TECHNOLOGY FOR DYNAMIC ALLOCA-TION OF THE SYSTEM RESOURCES TO OPTIMIZE SOME MEASURE OF SYSTEM EFFECTIVENES. THE ADVANTAGES OF THIS NEW TYPE OF SYSTEM INCLUDE: INCREASED ON-BOARD INTELLIGENCE (OBTAINED BY MAKING MOST EFFICIENT USE OF THE GIVEN SYSTEM RESOURCES); INCREASED SYSTEM AVAILABILITY

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>(OBTAINED BY ISOLATING FAILURES AND REALLOCATING SYSTEM RESOURCES TO REPLACE FAILED UNITS); ADAPTIVE RESPONSE TO REAL-TIME LOAD (A FEATURE OF THE DYNAMIC ALLOCATION PROCEDURE); AND EXTENDED LIFE CYCLE (OBTAINED BY REALLOCATION OF THE SYSTEM RESOURCES IN RESPONSE TO GROUND-ORDERED MODIFICATIONS TO ALGORITHMS AND SOFTWARE.</p>		

F&H APPLIED SCIENCE ASSOCS INC 305 PEMBROOK AVE MOORESTOWN, NJ 08057 P R HERCZFELD	AF	\$ 49,500
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TITLE:  
OPTICALLY CONTROLLED MILLIMETER WAVE PHASED ARRAY ANTENNA FOR  
AIRBORNE APPLICATIONS

T 44 OFFICE: ESD/XRCT

THIS PROJECT IS CONCERNED WITH RESEARCH RELATED TO THE DESIGN AND PROTOTYPE DEVELOPMENT OF AN OPTICALLY CONTROLLED PHASED ARRAY ANTENNA. THE SYSTEM WILL OPERATE IN THE MICROWAVE AND MILLIMETER WAVE FREQUENCIES. IT WILL UTILIZE MONOLITHIC MICROWAVE CIRCUITS AND FIBEROPTIC DISTRIBUTION SYSTEM.

FAILURE ANALYSIS ASSOCS 2225 E BAYSHORE RD PALO ALTO, CA 94303 PIOTR D MONCARZ	AF	\$ 44,872
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TITLE:  
EQUIVALENT MATERIAL PROPERTIES FOR REINFORCED CONCRETE

T 295 OFFICE: AFESC/RDXP

AN ANALYTICAL MODEL FOR REINFORCED CONCRETE IS PROPOSED WHICH RELATES MATERIAL DEGRADATION OF THE CONCRETE TO STRAINS IN THE REINFORCEMENT. THE REINFORCEMENT WILL BE DISTRIBUTED THROUGH THE CONCRETE TO PRODUCE A HOMOGENEOUS MATERIAL. THE MODEL WILL DISTINGUISH BETWEEN TENSION AND SHEAR CRACK BEHAVIOR -- THE TWO MAIN MODES OF CONCRETE FAILURE. THE CONCRETE REINFORCEMENT INTERACTION WILL BE MODELED THROUGH BOND STRENGTH REPRESENTATION IN TERMS OF AN INDEPENDENT COMPONENT IN THE COMPOSITE MATERIAL DESCRIPTION. THE MODEL WILL BE INCORPORATED INTO AN EXISTING COMMERCIAL FINITE ELEMENT CODE AND TESTED ON SIMPLE EXAMPLES.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
FASTMAN INC BEN FRANKLIN TECH CTR HRL BLDG F BETHLEHEM, PA 18015 MICHAEL TUCKER TITLE: PROTOTYPE OF A ROBOT CALIBRATION SYSTEM DEVELOPMENT T 101 OFFICE: NSWC	NAVY	\$ 49,886

FASTMAN, INC. IS REQUESTING A PHASE I GRANT TO FUND PART OF THE DEVELOPMENT COSTS OF A ROBOT CALIBRATION SYSTEM DESIGNED TO IMPROVE THE ACCURACY AND LONG-TERM REPEATABILITY OF ROBOTS. OUR SYSTEM WILL IMPROVE THE PERFORMANCE OF ONLINE AND OFFLINE PROGRAMMED ROBOTS WHICH ARE USED IN THE GUIDANCE MANUFACTURING PROCESS. THE SYSTEM IS BASED ON A MODELING AND CONTROL TECHNIQUE WHICH IMPROVES THE ACCURACY OF THE ROBOT'S TRAJECTORY AT ITS END POSITION AND ORIENTATION (POSE). A CORRECTION ALGORITHM IS USED TO GENERATE JOINT CORRECTIONS WHICH, WHEN ADDED TO THE NOMINAL JOINT SOLUTIONS DETERMINED BY THE ROBOT'S CONTROLLER, MAKE THE ACHIEVED POSE EQUAL TO THAT DESIRED. THE CORRECTION ALGORITHM REQUIRES THAT A MODEL OF THE ACTUAL ROBOT LINKAGE BE DETERMINED. OUR SYSTEM DETERMINES THAT MODEL USING A SERIES OF ACCURATE POSE MEASUREMENTS AND A CALIBRATION ALGORITHM DEVELOPED BY THE OWNERS OF FASTMAN. THE POSE MEASUREMENTS ARE MADE USING AN INEXPENSIVE POSE SENSOR, ALSO DEVELOPED BY THE OWNERS OF FASTMAN. THE CALIBRATION SYSTEM ALLOWS POSES GENERATED BY TASK PROGRAMS, INCLUDING THOSE GENERATED ONLINE OR OFFLINE, TO BE STORED AS QUALIFIED POSES. THE USE OF QUALIFIED POSES MAKE THESE PROGRAMS INDEPENDENT OF THE ROBOT'S PERFORMANCE AND THE PARTICULAR ROBOT OR ROBOT TYPE USED TO PERFORM THE TASK.

FATIGUE TECHNOLOGY INC 150 ANDOVER PK W SEATTLE, WA 98188 MICHAEL A LANDY TITLE: FATIGUE LIFE ENHANCEMENT OF LUGS T 85 OFFICE: NAVAIR	NAVY	\$ 50,000
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FATIGUE LIFE ENHANCEMENT OF BUSHED TITANIUM LUGS WILL BE INVESTIGATED. A UNIQUE TECHNIQUE, FORCEMATE (FM), FOR INSTALLATION OF BUSHINGS WILL BE DEMONSTRATED. EFFECT OF PROCESS PARAMETERS WILL BE EVALUATED AND THOSE PARAMETERS OPTIMIZED FOR THE PARTICULAR CONFIGU-

FISCAL YEAR 1986

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RATION UNDER INVESTIGATION. AT EACH PHASE OF THE INVESTIGATION, FATIGUE LIFE COMPARISONS WILL BE MADE BETWEEN LUGS AND BUSHINGS INSTALLED USING THE FM PROCESS, AND LUGS WITH BUSHING INSTALLED USING TRADITIONAL TECHNIQUES.

FIBER MATERIALS INC BIDDEFORD INDUSTRIAL PK BIDDEFORD, ME 04005 JOHN W HERRICK TITLE: FASTENER/JOINING METHOD FOR CARBON/CARBON STRUCTURES T 124 OFFICE: AFWAL/FI	AF	\$ 48,249
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THE EXCELLENT PROPERTIES OF CARBON-CARBON (C/C) COMPOSITES MAKE THESE MATERIALS PRIME CANDIDATES FOR HIGH TEMPERATURE RESISTANT STRUCTURES ON ADVANCED MISSILES. HOWEVER, C/C COMPONENTS MUST BE JOINED TOGETHER TO PRODUCE A FINAL STRUCTURE. THE USE OF ADHESIVE BONDING AND METALLIC FASTENERS IS NOT PRACTICAL AT HIGH TEMPERATURES. THE MOST DESIRABLE FASTENER TO JOIN C/C COMPOSITES TOGETHER WOULD BE FABRICATED FROM C/C TO MAINTAIN GOOD STRENGTH AT TEMPERATURES TO AT LEAST 2500 DEG F ALONG WITH LIGHTWEIGHT AND LOW COEFFICIENT OF THERMAL EXPANSION. FABRIC REINFORCE (2-D)C/C WILL NOT BE SUITABLE BECAUSE OF LOW SHEAR STRENGTH. A PROGRAM IS PROPOSED TO DEVELOP AND EVALUATE ECONOMICAL 3-D AND 4-D C/C COMPOSITES AS FASTENERS TO JOIN C/C COMPOSITE PANELS TOGETHER. AFTER FASTENER REQUIREMENTS DEFINITION AND DESIGN TASKS, 3D AND 4D PERFORMS WILL BE WOVEN WITH HIGH STRENGTH CARBON FIBERS. ALL WEAVING WILL BE DONE ON FULLY AUTOMATED LOOMS FOR MINIMUM COST. C/C PANELS WILL BE FULLY DENSIFIED BY A PROCESS THAT CAN BE SCALED UP TO A LOW COST MANUFACTURING PROCEDURE. THREADED RODS AND NUTS WILL BE MACHINED FROM THE 3D AND 4D C/C AND EVALUATED FOR MECHANICAL AND THERMAL EXPANSION PROPERTIES. A DEMONSTRATION C/C BOLTED JOINT WILL BE FABRICATED.

FIBER MATERIALS, INC. BIDDEFORD INDUSTRIAL PARK BIDDEFORD, ME 04005 STEPHEN M. BIDDLE TITLE: MECHANICAL DAMPING CHARACTERIZATION OF CARBON-CARBON COMPOSITES T 11 OFFICE:	SDIO	\$ 49,956
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A NEED EXISTS FOR STRUCTURES WITH HIGH SPECIFIC STRENGTH AND STIFF-

FISCAL YEAR 1986

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NESS FOR SPACE BASED APPLICATIONS. CARBON-CARBON COMPOSITES ARE IDEAL CANDIDATES BASED ON THEIR THERMAL STABILITY AND HIGH TEMPERATURE PROPERTIES INCLUDING THERMAL SHOCK RESISTANCE, AND INHERENT LASER AND NUCLEAR HARDENING. LONG USED FOR NOSETIP AND ROCKET NOZZLE APPLICATIONS, CARBON-CARBON HAS BEEN WELL CHARACTERIZED FOR BASIC MECHANICAL AND THERMAL PROPERTIES. RECENTLY FINDING USES FOR PRIMARY STRUCTURAL APPLICATIONS, ONLY LIMITED DYNAMIC, MECHANICAL PROPERTIES HAVE BEEN PREVIOUSLY STUDIED. THIS PROGRAM WILL QUALIFY THE DAMPING PROPERTIES OF A 2-D CARBON-CARBON COMPOSITE IN A RANGE OF FREQUENCIES FROM 1 TO 100 Hz. CARBON-CARBON IS A FIBER REINFORCED MATERIAL WITH A CARBON MATRIX CONTAINING DISCONTINUOUS MICROCRACKS. IT IS THE PRESENCE OF THESE MICROCRACKS OPENING AND CLOSING THAT MAY ALLOW THE MATERIAL TO DISSIPATE MECHANICAL ENERGY IN THE FORM OF HEAT. TWO MATERIALS WITH DIFFERENT MICROCRACK DENSITIES WILL BE SUBJECTED TO CYCLICAL 3-JOINT LOADING AT DIFFERENT FREQUENCIES. A COMPARISON OF THE FREQUENCY OF LOADING VERSUS THE ENERGY DISSIPATED WILL BE MADE FOR EACH OF THE MICROCRACKED MATERIALS.

FIBER MATERIALS, INC.  
BIDDEFORD INDUSTRIAL PARK  
BIDDEFORD, ME 04005  
RAY KELLER

SDIO

\$ 49,999

TITLE:

PASSIVELY DAMPED CARBON/CARBON

T 11 OFFICE:

CARBON-CARBON COMPOSITES ARE CURRENTLY BEING DEVELOPED FOR USE IN SPACE STRUCTURES. THE LARGE STRUCTURES AND PLATFORMS FOR WHICH THEY WILL BE USED REQUIRES BOTH ACTIVE AND PASSIVE DAMPING SYSTEMS TO CONTROL ENVIRONMENTAL AND OPERATIONAL EXCITATIONS. MAGNETO-STRICTIVE MATERIALS HAVE BEEN UTILIZED IN THE PAST TO DISSIPATE VIBRATIONAL ENERGY THROUGH THE FORMATION OF A MAGNETIC FIELD. THE PURPOSE OF THIS PROPOSAL IS TO INVESTIGATE THE EFFECTS OF SUCH A MATERIAL ON THE PASSIVE DAMPING PROPERTIES OF CARBON-CARBON. TWO DENSIFIED CARBON-CARBON LAY-UPS WILL BE FABRICATED FOR THIS PROGRAM; ONE A BASELINE CARBON-CARBON, THE OTHER WITH FERRITE PARTICLES DISTRIBUTED THROUGHOUT THE MATRIX. THE FERRITE PARTICLES WILL BE COATED WITH A THIN LAYER OF AN INERT CERAMIC MATERIAL TO PROTECT THEM FROM REACTION WITH THE CARBON MATRIX. TESTING WILL BE CARRIED OUT TO EVALUATE THE MECHANICAL PROPERTIES AND DAMPING CHARACTERISTICS OF THE MAGNETO-STRICTIVE MATRIX AND COMPARE THEM TO THOSE BASELINE CARBON-CARBON.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
FIBERTEK INC 510-A HERNDON PKWY HERNDON, VA 22070 DR HORACIO R VERDUN TITLE: NEW MATERIALS FOR TUNABLE SOLID-STATE LASERS T 66 OFFICE: CECOM/AMSEL	ARMY	\$ 49,665

ADVANCED TUNABLE LASER MATERIALS FORM THE BASIS FOR SATISFYING FUTURE ARMY SYSTEM REQUIREMENTS. SINCE IT IS NOT YET POSSIBLE TO PREDICT FROM THE EXISTING BODY OF SOLID-STATE THEORY WHICH HOST CRYSTAL AND ACTIVE-ION DOPANT LEADS TO A SUITABLE LASER FOR A GIVEN WAVELENGTH RANGE, AN EMPIRICAL APPROACH IN MATERIALS DEVELOPMENT FOR TUNABLE LASERS IS NECESSARY. THE PROPOSED EFFORT ADDRESSES THIS SITUATION BY MAKING USE OF A VERY COST-EFFECTIVE TECHNIQUE FOR THE GROWTH OF SMALL SAMPLES SUITABLE FOR CHARACTERIZATION.

FIBERTEK INC 510-A HERNDON PKWY HERNDON, VA 22070 DR WALTER KOECHNER TITLE: HIGH REPETITION RATE SOLID-STATE LASER FOR BOTTOM MAPPING T 14 OFFICE: USMC/NCSC	NAVY	\$ 46,081
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CERTAIN APPLICATIONS IN COASTAL HYDROGRAPHY REQUIRE A SHORT PULSE WIDTH, HIGH REPETITION RATE OUTPUT FORMAT IN THE GREEN SPECTRAL REGION. A DESIGN FOR A SOLID-STATE LASER IS DESCRIBED WHICH WILL GENERATE 5 NANOSECOND PULSES AT AN ENERGY OF 0.5 mJ PER PULSE AND A REPETITION RATE OF 10KHz. THE OUTPUT WAVELENGTH WILL BE 532 nm. THE ONLY SYSTEM WHICH CURRENTLY CAN GENERATE VERY SHORT PULSES AT THE 10KHz PULSE REPETITION RATE IS THE CO-VAPOR LASER OPERATED IN THE PULSE TRANSMISSION MODE. COMPARED TO THE LATTER SYSTEM THE PROPOSED LASER WILL BE AN ORDER OF MAGNITUDE MORE EFFICIENT AND SUBSTANTIALLY SMALLER IN SIZE AND WEIGHT.

FIBERTEK, INC 510-A HERNDON PKWY HERNDON, VA 22070 H VERDUN, PHD TITLE: NEW NONLINEAR MATERIALS SUITABLE FOR OPTICAL COMPUTING T 9 OFFICE:	SD10	\$ 49,665
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THREE CLASSES OF MATERIALS ARE PROPOSED WHICH SHOW PROMISE FOR

FISCAL YEAR 1986

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OPTICAL BISTABILITY. THE MATERIALS HAVE IN COMMON AN EXTREMELY HIGH ABSORPTION COEFFICIENT AT AN OPTICAL RESONANCE, THIS WILL ALLOW THE DESIGN OF VERY THIN FABRY-PEROT RESONATORS. THE MATERIALS WHICH HAVE BEEN IDENTIFIED AS PART OF AN IR&D EFFORT ARE BELIEVED TO HAVE HIGHER NON-LINEAR PROPERTIES COMPARED TO SYSTEMS CURRENTLY UNDER INVESTIGATION.

FIRST OMEGA GP INC 10205 W EXPOSITION AVE LAKEWOOD, CO 80226 SAMUEL C WU TITLE: ICING MONITORING EQUIPMENT T 288	AF	\$ 48,787
OFFICE: AEDC/DOT		

AN ICING DETECTION SYSTEM BASED ON OPTICAL REFRACTOMETRIC TECHNIQUES IS DESCRIBED IN THIS PROPOSAL. THE FIRST OMEGA GROUP, INC. PROPOSES TO DEMONSTRATE THE APPLICABILITY OF THIS CONCEPT TO ENABLE THE CONSTRUCTION OF ICING MONITORING EQUIPMENT SUITABLE FOR INCLUSION IN PROPULSION TEST UNITS CONDUCTING SIMULATED ALTITUDE TESTING OF TURBINE ENGINES WITH INLET TEMPERATURES AS LOW AS MINUS 80 DEGREES F. THE ENVISIONED INSTRUMENT WILL RELIABLY AND IN REAL TIME PROVIDE A WARNING AT THE ONSET OF ICING. THE DESIGN OF THE INSTRUMENT AS PRESENTLY CONCEIVED WILL NOT POSE A SAFETY TO OPERATING AND MAINTENANCE PERSONNEL. THE USE OF POLYMERIC MATERIALS SHOULD PREVENT SERIOUS DAMAGE TO A TURBINE ENGINE EVEN IF THE SENSOR SHOULD BE DAMAGED AND SUBSEQUENTLY INGESTED. THE OBJECTIVE OF PHASE I IS THE COMPLETION OF DESIGN AND LABORATORY EVALUATION OF THE SUITABILITY OF THE CONCEPT. IN PHASE II, AN INSTRUMENT BASED UPON THE PRINCIPLES DEMONSTRATED IN PHASE I WOULD BE DESIGNED, CONSTRUCTED AND FIELD TESTED. IF PROVEN FEASIBLE, THIS CONCEPT ENABLES A NEW CLASS OF ICING DETERMINATION INSTRUMENT.

FIRST OMEGA GP INC 10205 W EXPOSITION AVE LAKEWOOD, CO 80226 CHARLES E BROSSIA TITLE: COOLING SYSTEM DEGRADATION INDICATOR T 117	ARMY	\$ 48,981
OFFICE: TACOM/AMSTA		

A MAJOR CAUSE OF ENGINE FAILURE IN COMBAT AND TACTICAL VEHICLES IS

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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OVERHEATING DUE TO DETERIORATION OF COOLING SYSTEM PERFORMANCE WITH TIME AND USE. THIS PROPOSAL DESCRIBES THE EXPLORATORY DEVELOPMENT OF A COOLING SYSTEM DEGRADATION INDICATOR. THE EFFICIENCY OF A COOLING SYSTEM WILL BE ASSESSED BY COMPARING THE DEGREE OF COOLING PRESENTLY BEING ACHIEVED WITH A STANDARD VALUE THAT IS INDICATIVE OF A COOLING SYSTEM OPERATING AT ORIGINAL PERFORMANCE SPECIFICATIONS. FIRST OMEGA GROUP, INC. PROPOSES TO 1) DESIGN SUCH A SYSTEM USING SOLID STATE ELECTRONICS FOR TEMPERATURE SENSING AND SIGNAL PROCESSING; 2) BUILD PROTOTYPES OF THE SYSTEM; 3) EVALUATE SAME IN THE LABORATORY FOR PERFORMANCE, RELIABILITY AND COMPLIANCE WITH THE SOLICITATION. SINCE THIS DEVICE WILL ALERT OPERATORS TO A FAILING COOLING SYSTEM BEFORE DAMAGE OCCURES, SAVINGS CAN BE EXPECTED IN REDUCED MAINTENANCE COSTS, IMPROVED ENGINE EFFICIENCY AND VEHICLE UTILIZATION, AND BETTER MILITARY READINESS. FIRST OMEGA GROUP, INC. BELIEVES THIS INDICATOR CAN BE FURTHER DEVELOPED INTO A MARKETABLE PRODUCT.

FISCHER CUSTOM COMMUNICATIONS INC 10710A S LA CIENEGA BLVD INGLEWOOD, CA 90304 J F FISCHER TITLE: WIDEBAND ELECTROMAGNETIC FIELD SENSORS T 94 OFFICE: LABCOM/HDL	ARMY	\$ 32,503
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FISCHER CUSTOM COMMUNICATIONS, INC. PROPOSES TO DESIGN AND FABRICATE ELECTRIC AND MAGNETIC FIELD SENSORS TO OPERATE OVER THE 10 KHz - 1 GHz FREQUENCY RANGE. THE ELECTRIC FIELD SENSORS WILL BE CAPABLE OF SENSING ELECTRIC FIELDS IN THE RANGE OF .01 V/M TO 150 KV/M. THE MAGNETIC FIELD SENSORS WILL BE CAPABLE OF SENSING MAGNETIC FIELDS IN THE RANGE OF 0.1 mA/M TO 800 A/M. EACH SENSOR WILL OUTPUT A VOLTAGE PROPORTIONAL TO THE MEASURED FIELD AND WILL WORK INTO A 50 ohm LOAD IMPEDANCE. THE SENSORS FOR FABRICATION WILL USE PROVEN METHODOLOGY AND COMPONENT STRUCTURES. FISCHER CUSTOM COMMUNICATIONS, INC. WILL ALSO PROVIDE DESIGN CONCEPTION OF A NEW TECHNOLOGY SENSOR USING AN ENTIRELY FIBEROPTIC APPROACH. THIS SENSOR COMPOSED ENTIRELY OF DIELECTRIC MATERIAL WILL NOT PERTURB THE FIELDS IT IS SENSING.

FLAM & RUSSELL INC PO BOX 444 HORSHAM, PA 19044 DONALD E GROFF TITLE: LOW COST BROADBAND POWER DIVIDER T 163 OFFICE: PMTC	NAVY	\$ 49,391
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A LOW COST BROADBAND MICROWAVE POWER DIVIDER HAS THE POTENTIAL FOR



FISCAL YEAR 1986

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SIGNIFICANTLY REDUCING THE COST OF THREAT ENVIRONMENT GENERATORS USED IN EW TEST SYSTEMS. THE OBJECTIVE OF THIS PROJECT IS TO DESIGN A LOW COST POWER DIVIDER SPECIFICALLY FOR USE IN LABORATORY EW TEST SYSTEMS IN THE 0.5 TO 4.0 GHz RANGE. THIS COST REDUCTION WILL BE ACHIEVED BY CHOOSING MATERIALS, COMPONENTS, ASSEMBLY TECHNIQUES, AND TEST PROCEDURES SPECIFICALLY FOR THIS CLASS OF SERVICE. A CONVENTIONAL CIRCUIT CONFIGURATION WILL BE USED. IT IS ESTIMATED THAT AS MUCH AS AN ORDER OF MAGNITUDE COST REDUCTION CAN BE ACHIEVED, COMPARED TO PRESENTLY AVAILABLE DEVICES.

FLOW RESEARCH CO

NAVY

\$ 49,803

21414 68TH AVE S

KENT, WA 98032

R P TURCOTTE

TITLE:

PHASE RELATIONSHIPS IN HIGH TEMPERATURE CERAMICS

T 123

OFFICE: NSWC

PHASE BEHAVIOR STUDIES OF THE  $\text{HfO}_2/\text{Ta}_2\text{O}_5$  AND  $\text{HfC}/\text{TaC}$  SYSTEMS ARE PROPOSED. THIS WORK EMPHASIZES MEASUREMENT OF LIQUIDOUS TEMPERATURES AND WILL IDENTIFY PHASES PRESENT BETWEEN ABOUT 1500 DEG C AND 2500 DEG C. THE PROPOSAL INCLUDES NOVEL IN SITU METHODS INVOLVING  $\text{CO}_2$  LASER HEATING AND THE USE OF ANNEAL QUENCH METHODS. A DIFFUSION COUPLE APPROACH IS PROPOSED AS THE MOST EFFICIENT MEANS OF EVALUATING PHASE FORMATION THROUGH USE OF ELECTRON MICROSCOPY (WITH X-RAY MICROANALYSIS CAPABILITIES) AND X-RAY DIFFRACTION METHODS. THE EFFECT OF COMBUSTION GASES ON PHASE BEHAVIOR WILL BE AN IMPORTANT RESULT OF THE STUDY.

FLOW RESEARCH CO

NAVY

\$ 49,859

21414 68TH AVE S

KENT, WA 98032

DR BIROL SONUPARLAK

TITLE:

HIGH STRENGTH HAFNIUM CARBIDE FIBER PRODUCTION

T 124

OFFICE: NSWC

THE PROPOSED WORK WILL EVALUATE THE FEASIBILITY OF HAFNIUM CARBIDE FIBER PRODUCTION THROUGH PYROLYSIS OF ORGANOHAFNIUM POLYMER PRECURSORS. IN THIS CHEMICAL APPROACH TO CERAMIC PROCESSING, THE METHODS

FISCAL YEAR 1986

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<p>TO SYNTHESIZE ORGANOMETALLIC CHEMICALS SUITABLE FOR THE FORMATION OF ORGANOHAFNIUM POLYMERS AND TO FORM POLYMERIC FIBERS WITH AN (-Hf-C-Hf-) BACKBONE WILL BE EXPLORED. THE POLYMERS WILL THEN BE PYROLYZED TO GIVE HfC FIBERS. THEY WILL BE CHARACTERIZED USING X-RAY DIFFRACTION, SCANNING ELECTRON MICROSCOPY, SPECTROSCOPIC ANALYSIS, AND TENSILE STRENGTH AND ELASTIC MODULUS MEASUREMENTS.</p>		

FLOW RESEARCH CO 21414 68TH AVE S KENT, WA 98032 DR ALAN MUELLER TITLE: MODELING TECHNIQUES FOR COMPOSITES SUBJECTED TO RAPID THERMAL PULSE LOADING T 132	AF	\$ 49,836
OFFICE: AFWAL/FI		

COMPOSITE STRUCTURES IN SPACE MAY BE SUBJECT TO SOURCE OF THERMAL ENERGY, WHICH INCLUDES X-RAYS FROM NUCLEAR WEAPONS AND HIGH ENERGY LASER LIGHT. THIS PROPOSAL ADDRESSES THE NEED FOR ANALYSIS TOOLS TO PREDICT THE EFFECTS OF RAPID THERMAL PULSE LOADING ON AEROSPACE COMPOSITE MATERIALS. A MAJOR OBJECTIVE OF THIS PHASE I STUDY IS TO DETERMINE THE FEASIBILITY AND MAGNITUDE OF EFFORT TO DEVELOP SUCH AN ENGINEERING DESIGN TOOL. THE FEASIBILITY OF THE DESIGN CODE WILL BE EVALUATED BY MODIFYING AND COUPLING EXISTING CODES; ONE THAT ANALYZES THE STRESS WAVE PRODUCED BY THE THERMAL LOAD AND ANOTHER THAT EVALUATES THE INTERACTION OF THE STRESS PULSE WITH DELAMINATIONS IN THE MATERIAL. THE LEVEL OF EFFORT TO DEVELOP A SINGLE INTEGRATED DESIGN CODE CAPABLE OF ANALYZING THERMODYNAMIC PROCESSES IN COMPOSITE STRUCTURES CONTAINING DELAMINATIONS WILL BE DETERMINED.

FLOW RESEARCH CO 21414 68TH AVE S KENT, WA 98032 DR SURESH MENON TITLE: NUMERICAL MODELING OF NOSETIP GASJET AT HYPERSONIC SPEED T 193	AF	\$ 57,013
OFFICE: BMO/MYSC		

THE JET INJECTION AT THE TIP OF AN AXISYMMETRIC NOSE CONE IN HYPERSONIC FLOW WILL BE STUDIED BY AN EFFICIENT AND ACCURATE METHOD.

AD-A185 204

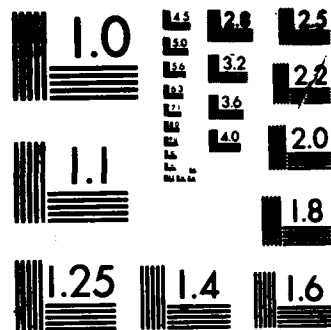
DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
(SBIR) ABSTRACTS OF PHASE I AWARDS (1986)(U) DEPARTMENT  
OF DEFENSE WASHINGTON DC 1986

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MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

FISCAL YEAR 1986

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CAL SCHEME. THE PROPOSED RESEARCH WILL INVESTIGATE AND DEVELOP THE NUMERICAL SCHEME FOR THE FULL NAVIER-STOKES EQUATION USING A TOTAL VARIATION DIMINISHING (TVD) TYPE OF ADAPTIVE DISSIPATION TO RESOLVE THE STRONG SHOCK ACCURATELY WITHOUT GENERATING SPURIOUS OSCILLATIONS. THE NOSE JET INJECTION BOUNDARY CONDITIONS WILL BE STUDIED IN DETAIL AND WILL BE FORMULATED IN TERMS OF PHYSICAL CONTROLLABLE PARAMETERS. TEST CASES AT VARIOUS MACH NUMBERS IN THE HYPERSONIC REGIME WILL BE COMPUTED TO EVALUATE THE ADAPTIVE DISSIPATION NUMERICAL SCHEME AND THE NOSE JET INJECTION CONDITIONS. THE EFFECT OF JET INJECTION ON THE HEAT TRANSFER RATE TO THE SURFACE WILL ALSO BE DETERMINED.

FLOW RESEARCH CO	ARMY	\$ 49,965
21414 - 68TH AVE S		
KENT, WA 98032		
PHILIP BONDURANT		
TITLE:		
AUTOMATED CARTRIDGE CASE CUP INSPECTION		
T 33 OFFICE: ARDC/SMCAR		

THE DEVELOPMENT OF AN AUTOMATED CUP INSPECTION MODULE IS PROPOSED. THE OBJECTIVES OF THE PHASE I EFFORT ARE TO ESTABLISHED THE PARAMETERS WHICH MUST BE MEASURED AND THEIR REQUIRED RESOLUTION. THE PARAMETERS INCLUDE HARDNESS, OUTSIDE AND INSIDE DIAMETERS, BASE THICKNESS, TOTAL LENGTH, AND WALL THICKNESS. IN PHASE I, THE MEASUREMENT CONCEPTS WILL BE MOCKED-UP AND DYNAMICALLY TESTED TO VERIFY THEIR GAUGING ACCURACIES. LABORATORY TESTING WILL PROVIDE THE NECESSARY DATA TO CONFIRM THE CONCEPTUAL DESIGN AND LATER COMPLETE A DETAIL DESIGN. BASED ON THE PHASE I RESULTS, A PHASE II DEVELOPMENT EFFORT WILL DEVELOP A DETAILED CUP INSPECTION SYSTEM DESIGN AND THEN FABRICATE, ASSEMBLE, AND TEST THE SYSTEM.

FLOW RESEARCH CO	ARMY	\$ 49,941
21414 - 68TH AVE S		
KENT, WA 98032		
DR GEORG F MAUER		
TITLE:		
A PRESSURE AND TEMPERATURE TRANSDUCER FOR 700-MPa EXPLOSIVE		
ENVIRONMENTS - DEVELOPMENT		
T 24 OFFICE: ARDC/SMCAR		

THE OBJECTIVE OF THIS PROPOSAL IS TO DEVELOP A HIGH-ACCURACY, HIGH-

FISCAL YEAR 1986

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AMOUNT  
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RANGE PRESSURE AND TEMPERATURE TRANSDUCER FOR THE MEASUREMENT OF RAPID TRANSIENTS TO 700 MPa AND TEMPERATURES TO 3000 K, AS WELL AS HEAT TRANSFER, IN GUN INTERIORS. ALL THREE MEASURING FUNCTIONS WILL BE PERFORMED BY ONE SMALL (ABOUT 20 mm IN DIAMETER) SENSOR UNIT AND SOME EXTERNAL TEMPERATURE SENSORS. THE PRESSURE IS DETECTED BY CAPACITIVE METHODS USING A THICK, RUGGED TUNGSTEN MEMBRANE. THE SENSOR CAN OPERATE AT TEMPERATURES OF 2500 K. THE EXPLOSION TEMPERATURE IS SIMULTANEOUSLY MEASURED BY A SMALL HIGH-ACCURACY, HIGH-SPEED RADIATION DETECTOR CAPABLE OF WITHSTANDING TEMPERATURES OF 2000 K AND INTEGRATED IN THE PRESSURE SENSOR UNIT. THERMOCOUPLES OR OTHER STANDARD TEMPERATURE SENSORS ARE USED FOR THE HEAT TRANSFER MEASUREMENTS. A MICROCOMPUTER SAMPLES THE PRESSURE AND TEMPERATURE DATA. AS THE ONLY MOVING PART IS THE MEMBRANE, WITH A MAXIMUM DISPLACEMENT OF 5 MICROMETERS, IT IS EXPECTED THAT THE TRANSDUCER SYSTEM WILL BE QUITE RUGGED AND CAPABLE OF WITHSTANDING LARGE TEMPERATURE VARIATIONS AS WELL AS OVERLOADS UP TO TWICE ITS NOMINAL RANGE.

FLOW RESEARCH CO  
21414 - 68TH AVE S  
KENT, WA 98032

ARMY

\$ 49,774

TYLER FOLSOM

TITLE:

DATA BASE GRAPHICS INTERFACE FEASIBILITY STUDY  
T 194 OFFICE: CERL/COE

MICROCOMPUTER DATABASE MANAGEMENT SYSTEMS HAVE SIMPLIFIED THE TASK OF UPDATING AND MAINTAINING LARGE QUANTITIES OF INFORMATION. A PARALLEL DEVELOPMENT HAS BEEN THE EMERGENCY OF COMPUTER-AIDED DESIGN SYSTEMS THAT ENABLE AN OPERATOR TO EXAMINE AND MANIPULATE DRAWINGS. THE PROPOSED RESEARCH WILL INVESTIGATE THE POSSIBILITY OF COMBINING THE ADVANTAGES OF THE DATABASE MANAGEMENT SYSTEM WITH THOSE OF COMPUTER-AIDED DESIGN SYSTEM TO PRODUCE A HIGHLY EFFECTIVE INFORMATION SYSTEM. THE INITIAL RESEARCH AREA WILL BE AN ARMY SYSTEM THAT USES R:BASE 5000 TO MANAGE INFORMATION ON INSTALLATION FACILITIES AND CONSTRUCTION PROJECTS. ADDING A GRAPHICS CAPABILITY WILL ALLOW MAPS AND BUILDING DRAWINGS TO BE DISPLAYED.

FLOW RESEARCH INC  
21414 - 68TH AVE S  
KENT, WA 98032  
ARTHUR C DAY

AF

\$ 49,875

TITLE:

CLUSTER BEAM DEPOSITION TECHNOLOGY FOR OPTICAL COATINGS  
T 7 OFFICE: AFOSR/XOT

A SYSTEMATIC INVESTIGATION OF THE IONIZED CLUSTER BEAM (ICB)

FISCAL YEAR 1986

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DEPOSITION TECHNIQUE IS PROPOSED. THE ICB METHOD ALLOWS A BROAD RANGE OF CONTROL OVER THE SURFACE MOBILITY OF DEPOSITED ATOMS AND HAS BEEN APPLIED SUCCESSFULLY TO A VARIETY OF THIN FILM MATERIALS. HOWEVER, A NUMBER OF FACTORS HAVE HAMPERED U.S. RESEARCH IN THIS AREA, SO THAT THERE IS NOT NOW A SUFFICIENT BASE OF KNOWLEDGE OR EXPERIENCE TO ALLOW COMMERCIAL UTILIZATION. THE PROPOSED RESEARCH WILL FIRST ADDRESS SOME OF THE CRITICAL GAPS IN UNDERSTANDING OF THE ICB PROCESS, INCLUDING: 1) HOW ARE CLUSTERS FORMED; 2) WHAT IS THE ACTUAL MAKEUP OF A CLUSTER BEAM; 3) HOW DO CLUSTERS AND OTHER BEAM SPECIES INTERACT TO FORM THIN FILMS; AND 4) WHAT INTRINSIC ADVANTAGES DOES ICB HOLD OVER OTHER TECHNIQUES. THE PHASE I APPROACH WILL COMBINE MODELING AND EXPERIMENTAL WORK WITH AN EMPHASIS ON FRONT-END ISSUES OF BEAM GENERATION AND CHARACTERIZATION. A LIMITED SERIES OF THIN FILMS WILL ALSO BE GROWN AND STUDIED IN PREPARATION FOR A MUCH BROADER PROGRAM EMPHASIZING FILM DEVELOPMENT IN PHASE II RESEARCH.

FLUID PHYSICS IND  
4265 MANCHESTER AVE  
ENCINITAS, CA 92024  
RICHARD M TRACI

DNA \$ 52,445

## TITLE:

DUSTY FLOW PRESSURE GAUGE DESIGN ANALYSIS  
T 3 OFFICE: AM/SBIR

THE PROBLEM OF GAS DYNAMIC FLOW PROPERTY MEASUREMENT IN PARTICLE LADEN FLOWS IS ADDRESSED VIA AN ADVANCED NUMERICAL MODEL SIMULATION STUDY OF PRESSURE GAUGE RESPONSE. THE APPROACH UTILIZES A HIGH-ORDER ACCURATE NUMERICAL SOLUTION TECHNIQUE FOR TURBULENT TWO-PHASE FLOWS. GAUGES OF EXISTING DESIGN SUCH AS THE GREG/SNOB GAUGES WILL BE ANALYZED OVER A RANGE OF CLEAN AND DUSTY AIRBLAST FLOW ENVIRONMENTS AND GAUGE RESPONSE WILL BE COMPARED TO PRESCRIBED DUSTY FLOW PROPERTIES. THE EFFECT OF DESIGN PERTURBATIONS, LEADING TO IMPROVED FIDELITY OF GAUGE RESPONSE, WILL ALSO BE EXAMINED. FINALLY A PRELIMINARY PROGRAM PLAN WILL BE DEVELOPED FOR AN EXTENSIVE ANALYTICAL AND EXPERIMENTAL PROGRAM TO OPTIMIZE GAUGE DESIGN.

FLUOROCHEM, INC  
680 SOUTH AYON AVE  
AZUSE, CA 91702  
KURT BAUM

SDIO \$ 49,961

## TITLE:

CUBANE DERIVATIVES FOR PROPELLANT APPLICATIONS  
T 6 OFFICE:

CUBANE DERIVATIVES ARE POTENTIALLY USEFUL INGREDIENTS FOR PROPELLANT

FISCAL YEAR 1986

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APPLICATIONS, BUT PROCEDURES FOR LARGE-SCALE PRODUCTION OF THE MATERIALS ARE NOT AVAILABLE. ON THIS PROJECT, THE SYNTHESIS CHEMISTRY OF CUBAN-1,4-DICARBOXYLIC ACID WILL BE STUDIED WITH THE OBJECTIVE OF OBTAINING A ROUTE SUITABLE FOR THE PREPARATION OF POUND QUANTITIES OF THE MATERIAL. THE PREPARATION OF DERIVATIVES USEFUL FOR PROPELLANTS WILL BE STUDIED.

FOSTER ENGINEERING CO 23241 VENTURA BLVD - STE 309 WOODLAND HILLS, CA 91364 KENNETH FOSTER TITLE: BALLISTICALLY DELIVERED TARGET - ACTIVATED WEAPONS T 192                      OFFICE: BMO/MYSC	AF	\$ 50,000
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THE PROPOSED STUDY HAS TWO OBJECTIVES: 1) DESIGN OF A NON-NUCLEAR, TARGET-ACTIVATED ANTI-MISSILE MUNITION OF MINIMUM COMPLEXITY IN BOTH ITS DESIGN AND OPERATION BUT WITH SUFFICIENT EFFECTIVENESS AND MINIMUM WEIGHT; AND 2) IDENTIFICATION OF THE CRITICAL TECHNICAL ISSUES WHOSE SOLUTIONS ARE REQUIRED FOR THE NEAR TERM, LOW RISK DEVELOPMENT OF A RELIABLE AND LOW COST WEAPON. THE STUDY WILL HAVE SIX SEGMENTS: 1) FORMULATION OF CANDIDATE DESIGNS, 2) KILL EVALUATION, 3) DOWN-SELECTION OF CANDIDATE DESIGNS, 4) WEIGHT REDUCTION ANALYSES, 5) COUNTERMEASURE CONSIDERATIONS, AND 6) IDENTIFICATION OR CRITICAL TECHNICAL ISSUES. THE MAJOR PORTION OF THE EFFORT WILL BE IN SEGMENTS 1) AND 3). A NOVEL DESIGN OF A TARGET-ACTIVATED MUNITION FOR USE AGAINST IRBMS JUST LAUNCHED FROM CONCEALED MOBILE LAUNCHERS WILL SERVE AS A STARTING POINT FOR THE PROPOSED STUDY. IF SUCCESSFUL, THE STUDY COULD LEAD TO THE DEVELOPMENT OF HIGHLY VERSATILE, TARGET-ACTIVATED MUNITIONS WHICH 1) DEFEAT LAND-BASED MISSILES INDEPENDENT OF THE MEANS USED TO ASSURE THEIR PRE-LAUNCH SURVIVABILITY (E.G., MOBILITY AND SUPER HARD SILOS), AND 2) PIN DOWN ENEMY LAND-BASED BALLISTIC MISSILE DURING THE CRITICAL EARLY PORTION OF AN INVASION OF WESTERN EUROPE.

FOSTER-MILLER INC 350 SECOND AVE WALTHAM, MA 02254 JOSEPH S BOYCE TITLE: Z-DIRECTION TAPE REINFORCEMENT FOR COMPOSITE LAMINATES T 132                      OFFICE: NWC/NAVAIR	NAVY	\$ 64,603
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COMPOSITE LAMINATES MADE FROM CONVENTIONAL GRAPHITE-EPOXY ARE PRONE



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TO DELAMINATION DUE TO IMPACT OR EDGE EFFECTS. SOME MEANS OF IMPROVING COMPRESSIVE STRENGTH AFTER IMPACT IS DESIRED. STITCHING IS ONE OPTION, BUT CAUSES DAMAGE TO IN-PLANE PROPERTIES AND REQUIRES ACCESS TO BOTH SIDES OF THE LAYUP. THE PROPOSED TECHNIQUE UTILIZES SHORT BORON FIBERS ORIENTED IN THE Z (OR THICKNESS) DIRECTION TO REDUCE STRAIN ENERGY RELEASE RATE AND RETARD DELAMINATION. BORON FIBERS WILL BE INSERTED USING A SPECIALLY DEVELOPED REINFORCING TAPE. THE TECHNIQUE IS COMPLETELY COMPATIBLE WITH EXISTING PROCESSING METHODS AND CAN BE PERFORMED ON-TOOL. PROPOSED PHASE/I EFFORT CONSISTS OF TAPE DEVELOPMENT, PROCESSING AND STRUCTURAL TESTING OF SAMPLE Z-DIRECTION REINFORCED COMPOSITE LAMINATES.

FOSTER-MILLER INC

NAVY

\$ 49,313

350 SECOND AVE

WALTHAM, MA 02254

ROGER DEMLER

TITLE:

POWER SOURCES FOR AUTONOMOUS MOBILE ROBOTS - SURVEY AND EVALUATION

T 121

OFFICE: NSWC

MOBILE ROBOTS REQUIRE CONSIDERABLE AMOUNTS OF POWER TO PERFORM WORK, PROVIDE LOCOMOTION, AND RUN THE CONTROL ELECTRONICS. ARTIFICIAL INTELLIGENCE AND VISION PROMISE TO MAKE FUTURE MOBILE ROBOTS HIGHLY AUTONOMOUS AND THEY WILL BE EXPECTED TO OPERATE OVER SUBSTANTIAL DISTANCES FOR LONG PERIODS OF TIME. THE NEED FOR LIGHTWEIGHT, STABLE, POWERFUL ENERGY SOURCES THAT WITHSTAND TEMPERATURE EXTREMES, SHOCK, HUMIDITY, AND OTHER ENVIRONMENTAL HARDSHIPS IS BECOMING URGENT. THIS PROPOSAL DESCRIBES A PROGRAM FOR RIGOROUSLY EVALUATING EXISTING AND POTENTIAL MODILE ROBOT POWER SOURCES IN TERMS OF PERFORMANCE, DURABILITY, MAINTENANCE, SAFETY, STRATEGIC IMPLICATIONS, AND ECONOMIC CONSIDERATIONS. POWER SOURCES WILL BE RANKED ACCORDING TO TECHNICAL MERITS, COST FACTORS, AND AVAILABILITY. ONE OR TWO DESIGN CONFIGURATIONS WILL BE SELECTED FOR FURTHER DEVELOPMENT IN PHASE II.

FOSTER-MILLER INC

AF

\$ 58,908

350 SECOND AVE

WALTHAM, MA 02254

ANDREW C HARVEY

TITLE:

PINS AND BUSHINGS OF ARTICULATED LANDING GEAR LINKAGE JOINTS IMPROVEMENTS

T 146

OFFICE: AFWAL/FI

THE COSTS OF REPAIRING WORN LANDING GEAR LINKAGE JOINTS IS PROHIBI-

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TIVE. SINCE WEAR IS SUSTAINED BY SOFT BUSHINGS INSTEAD OF HARD PINS, THE LANDING GEAR MUST BE DISASSEMBLED, THE BUSHINGS REMOVED, THE LUGS RENOVATED, AND THE GEAR REASSEMBLED. THIS PROPOSAL PRESENTS MEANS TO REDUCE THE COST OF JOINT REPAIRS. DISCUSSED ARE NO-WEAR SOLUTIONS (HARD BUSHINGS, HARD PINS); SOLUTIONS IN WHICH THE PINS WEAR RATHER THAN THE BUSHINGS (HARD BUSHINGS, HARD PINS WITH SOFT SURFACES); AND A NOVEL SOLUTION USING A FLOATING SACRIFICIAL INTERMEDIATE MEMBER (HARD BUSHINGS, HARD PINS, SOFT INTERMEDIATE MEMBERS). THE SYSTEMATIC SELECTION OF MATERIALS, SURFACE COATINGS, AND SURFACE TRANSFORMATION PROCESSES BY TRIBOLOGICAL ANALYSIS IS INTRODUCED, AND A PROGRAM FOR SIMULATION-TESTING OF EXPERIMENTAL PINS AND BUSHINGS IS DESCRIBED.

FOSTER-MILLER INC

AF

\$ 62,995

350 SECOND AVE

WALTHAM, MA 02254

JAMES L RACICH

TITLE:

HIGH PERFORMANCE PBO (POLYBENZOBISOXAZOLE) FILM

T 166

OFFICE: AFWAL/ML

THE ORDERED POLYMERS PBT (POLYBENZOBISTHIAZOLE) AND PBO (POLYBENZOBISOXAZOLE) BOTH HOLD PROMISE AS HIGH STRENGTH, THERMALLY STABLE, CHEMICALLY RESISTANT AND ELECTRICALLY NONCONDUCTIVE MATERIALS. WHEREAS PBT HAS ENJOYED RATHER COMPLETE INVESTIGATION AND DEVELOPMENT IN FIBER AND FILM FORM, PBO HAS NOT. PBO MAY EXCEL PBT IN THE IMPORTANT AREAS OF TRANSVERSE MECHANICAL STRENGTH, ATOMIC OXYGEN RESISTANCE, AND EASE OF SYNTHESIS. UNIAXIALLY AND BIAXIALLY ORIENTED THIN FILMS OF PBO WILL BE PRODUCED BY ADAPTION OF METHODS AND EQUIPMENT PREVIOUSLY DEMONSTRATED SUCCESSFULLY WITH PBT. RESULTING PBO FILMS WILL BE CHARACTERIZED FOR MECHANICAL, THERMAL AND HYDROLYTIC BEHAVIOR, AND WILL BE CONTRASTED WITH SIMILARLY PROCESSED PBT FILMS. A SPECIAL EFFORT WILL BE MADE TO DETERMINE WHETHER THE COMPRESSIVE OR CROSS-MACHINE-DIRECTION PROPERTIES OF PBO FILMS ARE SUPERIOR TO THOSE OF PBT.

FOSTER-MILLER INC

AF

\$ 66,551

350 SECOND AVE

WALTHAM, MA 02254

ROBERT F KOVAR

TITLE:

IMPROVED SYNTHESIS OF POLY(BENZOBISTHIAZOLE) POLYMERS

T 166

OFFICE: AFWAL/ML

POLY [BENZO[1,2-d:4,5-d'] BISTHIAZOLE-2,6-DIYL)-1,4-PHENYLENE], XV

FISCAL YEAR 1986

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("TRANS" PBT) IS A LIGHTWEIGHT, NON-CONDUCTING, AROMATIC, HETERO-CYCLIC ORDERED POLYMER THAT EXHIBITS EXCEPTIONAL MECHANICAL, THERMAL, CHEMICAL AND ELECTRO-OPTICAL PROPERTIES. HOWEVER, DEVELOPMENT OF "TRANS" PBT POLYMER INTO ADVANCED STRUCTURAL COMPOSITES HAS BEEN HINDERED BY THE LACK OF AVAILABILITY OF THE MATERIAL IN SUFFICIENT QUANTITIES FOR EVALUATION. THE OBJECT OF THIS PROPOSAL IS TO EVALUATE THE FEASIBILITY OF REPLACING "TRANS" PBT (XV) WITH "CIS" PBT POLYMER (XIV) IN THE DEVELOPMENT OF ORDERED POLYMERS. "CIS" PBT MONOMER (I) WILL BE SYNTHESIZED IN HIGH YIELD AND PURITY VIA SIMPLIFIED, MORE DIRECT ROUTES THAT ARE ECONOMICAL AND AMENABLE TO SCALE-UP. HIGH MOLECULAR WEIGHT "CIS" PBT POLYMERS DERIVED FROM MONOMER I WILL FORM LIQUID CRYSTALLINE SOLUTIONS PROCESSABLE VIA SPECIAL TECHNIQUES INTO STRUCTURAL MATERIALS THAT EXHIBIT HIGH STRENGTH AND STIFFNESS AT ELEVATED TEMPERATURES. PHASE I OF THIS STUDY WILL DEMONSTRATE THE FEASIBILITY OF THE APPROACH. SUCCESSFUL COMPLETION OF PHASE I OBJECTIVES WILL HAVE PROFOUND INFLUENCE BEYOND THE SCOPE OF THIS STUDY, SINCE ORDERED PBT POLYMERS WILL BECOME READILY AVAILABLE VIA CONVENIENT, ECONOMICAL ROUTES, FOR DEVELOPMENT INTO USEFUL ARTICLES. PHASE II OF THIS STUDY WILL INCLUDE SCALE-UP OF "CIS" PBT POLYMER SYNTHESIS TO QUANTITIES SUFFICIENT FOR PROCESSING INTO BI-AXIALLY-ORIENTED FILMS OF HIGH STRENGTH AND STIFFNESS.

FOSTER-MILLER INC  
350 SECOND AVE  
WALTHAM, MA 02254  
ALAN LANE

AF

\$ 69,265

## TITLE:

COHERENT INFRARED FIBER OPTIC IMAGE BUNDLE FOR AIRCRAFT IR IMAGING SYSTEMS

T 118

OFFICE: AFWAL/AA

THE EXACT PLACEMENT AND PACKAGING OF INFRARED IMAGING SENSORS ABOARD HIGH PERFORMANCE AIRCRAFT IS LIMITED BY CONCERNS FOR AIRCRAFT RADAR CROSS SECTION, AIRCRAFT AERODYNAMICS AND THE FACT THAT EACH SENSOR MUST BE CLOSED-COUPLED TO ITS MATED DETECTOR/DEWAR MODULE. PRESENT TECHNOLOGY LIMITS THE ABILITY TO TRANSMIT IR IMAGE QUALITY LIGHT SIGNALS FROM OPTICS TO AN IMAGE INFORMATION VIA A COHERENT BUNDLE OF OPTICAL FIBERS DRAWN FROM NEW MATERIALS - HEAVY METAL FLUORIDE GLASSES (HMFG) - UNDER DEVELOPMENT BY THE TELECOMMUNICATIONS INDUSTRY FOR ULTRALOW LOSS REPEATERLESS TELECOMMUNICATIONS LINKS. THESE HMFG FIBERS EXHIBIT LOS LOSSES IN THE 3 TO 5 MICROMETER WAVELENGTHS, AN

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<p>IMPORTANT WINDOW FOR ON-BOARD IMAGE SYSTEMS. SUCH A TRANSMITTING LINK WILL ALLOW A NUMBER OF SENSORS TO BE REMOTELY CONNECTED TO A CENTRALLY LOCATED DETECTOR/DEWAR MODULE, WHICH WOULD BE TIME-SHARED THROUGH OPTICAL MULTIPLEXING TECHNIQUES. A COHERENT LINEAR BUNDLE OF THESE FIBERS WILL BE FABRICATED AND EVALUATED AGAINST BENCHMARKS DETERMINED FOR PHASE I. THE BUNDLE WILL BE TESTED USING A THERMAL IMAGING RADIOMETER. AN APPROXIMATE COMPARATIVE MTF WILL BE MEASURED. THE PHASE I PROGRAM WILL CONCLUSIVELY DEMONSTRATE WHETHER COHERENT BUNDLES OF IR TRANSMITTING OPTICAL FIBERS ARE TECHNICALLY AND ECONOMICALLY FEASIBLE FOR AIRCRAFT IR IMAGING SYSTEMS.</p>		

FOSTER-MILLER INC 350 SECOND AVE WALTHAM, MA 02254 ANDREW C HARVEY TITLE: HEAT PIPES FOR HIGH PRESSURE CZHOCHALSKI CRYSTAL FURNACES T 51 OFFICE: RADC/XPX	AF	\$ 58,171
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TO REDUCE THE CIRCUMFERENTIAL TEMPERATURE GRADIENTS DURING THE GROWTH OF IV - V COMPOUNDS AT HIGH TEMPERATURES AND PRESSURES (1325 DEG C AND 60 ATMOSPHERES), A HEAT PIPE CONSTRUCTION IS PROPOSED. THE PREFERRED HEAT PIPE IS IN THE FORM OF A SINGLE TOROID BUILT OF A TRI-LAYER CONSTRUCTION OF TUNGSTEN, GRAPHITE, AND SILICON CARBIDE, AND FILLED WITH LITHIUM. MULTIPLE TOROIDAL HEAT PIPES WOULD BE STACKED BETWEEN THE CRUCIBLE AND HEATING ELEMENTS, REDUCING CIRCUMFERENTIAL GRADIENTS, WHILE ALLOWING FOR VERTICAL TEMPERATURE CONTROL. THE HEAT PIPE CONSTRUCTION WILL BE ANALYZED AND TEST STRUCTURES FABRICATED. ALTERNATIVE DESIGNS AND MATERIALS WILL BE EVALUATED.

FOSTER-MILLER INC 350 SECOND AVE WALTHAM, MA 02254 ROBERT N TORBIN TITLE: RAPID SHAFT LINING SYSTEM FOR ICBM EGRESS T 242 OFFICE: BMO/MYSC	AF	\$ 68,905
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ENHANCED EGRESS REQUIREMENTS NECESSITATES A RATE OF ADVANCE OF 80 FT/HR FOR BOTH A BORING MACHINE AND GROUND SUPPORT LINING SYSTEM.

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THIS ADVANCE RATE IS BEYOND THE CURRENT TECHNICAL FEASIBILITY OF ALL STATE-OF-THE-ART LINING SYSTEMS. AN INNOVATIVE PRESSURIZED LINING SYSTEM USING A POLYMERIC MATERIAL IS PRESENTED WHICH WILL MEET BOTH THE STRUCTURAL, AS WELL AS, OPERATIONAL REQUIREMENTS OF THE EGRESS OPERATION. THE RAPID LINING SYSTEM POSSESSES A MECHANICAL SIMPLICITY AND OPERATIONAL PROCESS WHICH ALLOWS FOR CONTINUOUS, REMOTE CONTROL OF THE HARDWARE. THE LINING SYSTEM, AS CONCEIVED, WILL BE ADAPTABLE TO ANY EGRESS BORING MACHINE AND WOULD NOT INTERFERE WITH ANY MUCK HANDLING SCHEME. PHASE I WILL EXAMINE KEY TECHNICAL ISSUES INCLUDING LINING MATERIAL EVALUATION, DISTRIBUTION UNDER PRESSURE, DEVELOPMENT OF A CONCEPTUAL DESIGN AND EVALUATION OF MAJOR HARDWARE SYSTEMS.

FOSTER-MILLER INC  
350 SECOND AVE  
WALTHAM, MA 02254  
JOSEPH S BOYCE

AF

\$ 69,848

## TITLE:

INNOVATIVE CONTINUOUS SLIPFORMING FOR ICBM DEEP BASING TUNNEL  
LINING

T 243

OFFICE: BMO/MYSC

DEEP BASING FACILITIES MUST BE CONSTRUCTED TO RESIST HIGH LOADS FROM REPEATED NEAR SURFACE HIGH YIELD BLASTS. THE BASE LINING STRUCTURE MUST EXHIBIT BOTH COMPLIANCE AND TOUGHNESS TO MAINTAIN ITS INTEGRITY. CURRENT CAST-IN-PLACE AND PRECAST LINING SYSTEMS COUPLED WITH THE INSTALLATION OF A SEPARATE, ENERGY ABSORBING BACKPACKING LAYER ARE EXPENSIVE TO INSTALL, ARE LABOR INTENSIVE AND ARE NOT LIKELY TO ACHIEVE THE 25 FT/HR ADVANCE RATE GOAL. A NEW LINING SYSTEM WILL BE DEVELOPED TO OVERCOME THE DEFICIENCIES OF CURRENT TECHNOLOGY. THE PROPOSED SYSTEM IS A NEW SLIPFORMING APPROACH WHICH WILL BE ABLE TO CONTINUOUS LINE TUNNELS WITH A TWO LAYER COMPOSITE LINING DIRECTLY BEHIND A TUNNEL BORING MACHINE AT ADVANCED RATES OF AT LEAST 25 FT/HR. THE OBJECTIVE OF THIS PROPOSED PHASE I EFFORT IS TO DEVELOP SPECIFICATIONS FOR KEY COMPONENTS AND TO GENERATE A CONCEPTUAL DESIGN FOR THE SLIPFORMING SYSTEM. A KEY POTENTIAL PROBLEM WITH THE PROPOSED SYSTEM, THE DISTRIBUTION AND PLACEMENT OF THE THICKER OUTER LINING LAYER, WILL ALSO BE EVALUATED.

FOSTER-MILLER INC  
350 SECOND AVE  
WALTHAM, MA 02254  
RICHARD W LUSIGNEA

ARMY

\$ 68,817

## TITLE:

ORDERED POLYMERS FOR HIGH PERFORMANCE COMPOSITE STRUCTURES

T 110

OFFICE: MICOM

THE PROPOSED WORK WILL INVOLVE EVALUATION OF ORDERED POLYMER SHEET

FISCAL YEAR 1986

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AMOUNT  
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AND TAPE-REINFORCED COMPOSITE STRUCTURES FOR APPLICATIONS SUCH AS ROCKET MOTOR CASES, PRESSURE VESSELS AND OTHER CYLINDRICAL COMPONENTS. THE OBJECTIVE OF THE PROGRAM IS TO MAKE HIGH QUALITY FILM LAMINATES USING A FABRICATION PROCESS AMENABLE TO SCALE-UP. TEST SAMPLES WILL BE MADE, TESTED AND COMPARED WITH OTHER HIGHER PERFORMANCE COMPOSITE MATERIALS. FMI HAS DEVELOPED PROCESSING METHODS FOR MAKING HIGH STRENGTH HIGH STIFFNESS TAPES AND SHEETS FROM PBT (POLY P-PHENYLENE BENZOBISTHIAZOLE), AN ORDERED ROD-LIKE POLYMER PROCESSED FROM LIQUID CRYSTAL SOLUTIONS. PBT TAPE CAN PROVIDE PERFORMANCE IMPROVEMENT BY VIRTUE OF EXCELLENT MECHANICAL PROPERTIES, THERMAL AND ENVIRONMENTAL RESISTANCE, AND THE GEOMETRIC EFFICIENCY OF TAPE REINFORCEMENT OVER FIBER-REINFORCED COMPOSITES. THE PROPOSED PHASE I PROGRAM WILL EVALUATE PBT TAPE LAMINATES AND METHODS FOR PRODUCING ROCKET MOTOR CASES AND OTHER CYLINDRICAL STRUCTURES.

FOSTER-MILLER INC

ARMY

\$ 48,717

350 SECOND AVE

WALTHAM, MA 02254

LESLIE S RUBIN

TITLE:

ROWPU SEASIDE INTAKE SYSTEM

T 104

OFFICE: BRDC

FUTURE ARMY FIELD OPERATIONS MAY BE DEPENDENT ON THE SUCCESSFUL PRODUCTION OF POTABLE WATER FROM THE SEA. THE PLANNED EQUIPMENT IS EXPECTED TO INCLUDE THE REVERSE OSMOSIS WATER PURIFICATION UNIT (ROWPU) THAT PRESENTLY UTILIZES A FLOAT TO SUPPORT A WATER SUCTION HOSE AT THE SEASIDE INTAKE. THIS INTAKE SYSTEM IS PRONE TO PROBLEMS CAUSED BY MUD AND SILT INTAKE, LACK OF WATER DUE TO RECEDING TIDES, AND WAVE INDUCED DAMAGE. THE OBJECTIVE OF THE PROPOSED PROGRAM IS TO DETERMINE THE FEASIBILITY OF A NOVEL INTAKE SYSTEM THAT FACILITATES DEPLOYMENT, RETRIEVAL AND OPERATION IN A SEASIDE WAVE ZONE. THE PROPOSED SYSTEM IS EXPECTED TO ELIMINATE CLOGGING IN THE RAW WATER PUMP AND ELIMINATE SYSTEM DISTURBANCES AND DAMAGE FROM WAVES AND SHIPS. THE PROPOSED INTAKE SYSTEM CAN BE EASILY DEPLOYED FOR EXTENDED DISTANCES (LIMITED ONLY BY THE FEED PUMP'S NPSH) TO ENSURE THAT ITS FINAL POSITION IS IN SUFFICIENTLY DEEP WATER TO ACCOMMODATE TIDAL CHANGES. THE PROPOSED PHASE I PROGRAM WILL RESULT IN THE DESIGN, FABRICATION AND OCEANSIDE TESTING OF A FULL SCALE PROTOTYPE ROWPU SEASIDE INTAKE SYSTEM (RSIS). PHASE I TEST DATA WILL THEN BE USED TO DEVELOP A DESIGN OF AN IMPROVED/MILITARIZED RSIS THAT IS

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AMOUNT

SUITABLE FOR PHASE II DEVELOPMENT AND TESTING.

FOSTER-MILLER INC  
350 SECOND AVE  
WALTHAM, MA 02254  
GARY CZUPRYNA

ARMY

\$ 49,982

## TITLE:

SELECTIVE DISSOLUTION AND RECOVERY OF DEPLETED URANIUM FROM ARMOR  
PLATE

T 177

OFFICE: TECOM/JPG

THE ARMOR PLATES USED IN TESTING MUNITIONS CONTAINING DEPLETED URANIUM (DU) ARE SUBJECT TO DISPOSAL AS LOW-LEVEL RADIOACTIVE WASTE. THE OBJECTIVE OF THIS PROPOSAL IS TO DEVELOP SELECTIVE SOLVENTS THAT WILL PREFERENTIALLY ATTACK THE CONTAMINATED AREAS OF THE TARGET, REMOVING THE DU, AND LEAVING THE ARMOR PLATE UNAFFECTED AND INTACT. PREVIOUS WORK HAS BEEN DONE ON THE DISSOLUTION OF URANIUM FOR ANALYSIS, WHERE URANIUM IS THE PRIMARY METAL, WHILE OTHER WORK HAS BEEN REPORTED ON THE PASSIFYING EFFECTS OF INHIBITORS ON METAL ALLOYS FOUND IN THE TARGET MATERIAL. OUR PRIMARY APPROACH IS TO SYNTHESIZE AND TEST COMBINATIONS OF THESE SOLVLENTS AND ADDITIVES TO ARRIVE AT A SUITABLE SOLVLENT SYSTEM. IN ADDITION, THERE ARE CHELATING AGENTS USED IN THE FIELD OF ION EXCHANGE AND LIQUID MEMBRANES THAT WILL STRONGLY COMPLEX URANIUM RELATIVE TO THE TARGET MATERIAL. ADDING THESE CHELATES TO A SOLVENT SOLUTION WOULD ACCELERATE THE RATE OF URANIUM DISSOLUTION, BUT INHIBIT THE RATE OF IRON DISSOLUTION. A SECOND, MORE INNOVATIVE APPROACH DEALS WITH THE SYNTHESIS AND TESTING . . . ACID/CHELATE ADDITIVE COMBINATIONS. A SECONDARY OBJECTIVE WILL BE DEVOTED TO EVALUATING THE USE OF PRECIPITATION AND ION EXCHANGE FOR THE REMOVAL OF DU FROM THE SOLVENT FOR SOLVENT REUSE.

FOSTER-MILLER INC  
350 SECOND AVE  
WALTHAM, MA 02254  
BRUCE NAPPI

ARMY

\$ 50,558

## TITLE:

HUMAN CORE TEMPERATURE MEASUREMENT SYSTEM

T 219

OFFICE: AMRDC/SGRD

THE OBJECTIVE OF THIS PROGRAM IS TO DEMONSTRATE THE FEASIBILITY OF

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REMOTE MONITORING OF HUMAN CORE TEMPERATURE WITHOUT ANY PHYSICAL LINK WITH THE TEST SUBJECT. TEMPERATURE SENSING WILL BE CARRIED OUT BY AN INDUCTIVELY-COUPLED, INGESTED RADIOCAPSULE. IN PHASE I, AN EXISTING RADIOCAPSULE SYSTEM WILL BE UPGRADED AND ADAPTED TO MEET ARMY REQUIREMENTS. THIS UPGRADED SYSTEM WILL INCLUDE A RADIOCAPSULE, A BELT-MOUNTED TRANSPONDER AND A REMOTE DATALOGGER. THE SYSTEM WILL BE ASSEMBLED AND TESTED INVITRO IN A THERMAL WATER BATH. BATH TEMPERATURE, CAPSULE ORIENTATION AND TRANSMISSION RANGE WILL BE VARIED DURING THE TEST. THE DATA WILL BE ANALYZED TO DETERMINE (a) THE PRECISION AND ACCURACY OF THE TEMPERATURE READING, (b) THE MAXIMUM TRANSMISSION RANGE, (c) THE EFFECT OF CHANGES IN CAPSULE ORIENTATION, AND (d) THE BATTERY LIFE. THESE RESULTS WILL BE USED TO IDENTIFY THE REFINEMENTS NEEDED (IF ANY) TO MAKE THE SYSTEM SUITABLE FOR ARMY USE. IN PHASE II, THE REQUIRED REFINEMENTS WILL BE IMPLEMENTED AND THE SYSTEM EVALUATED WITH HUMAN SUBJECTS.

FOSTER-MILLER INC

AF

\$ 50,083

350 SECOND AVE

WALTHAM, MA 02254

PAUL J MARINACCIO

TITLE:

NONLINEAR OPTICAL MATERIALS

T 4 OFFICE: AFOSR/XOT

ORGANIC POLYMER MATERIALS WITH HIGHLY CONJUGATED PI ELECTRN SYSTEMS HAVE BEEN SHOWN TO EXHIBIT POTENTIALLY USEFUL THIRD ORDER NONLINEAR OPTICAL PROPERTIES. POLYPARAPHENYLENE BENZOBISTHIAZOLE (PBT) HAS RECENTLY BEEN SHOWN TO HAVE A HIGH LASER DAMAGE THRESHOLD AND A VALUE OF  $X(3)$  ABOUT ON THE ORDER OF MAGNITUDE HIGHER THAN THAT OF CS(2). THIS PLUS THE ENVIRONMENTAL STABILITY OF PBT ALONG WITH ITS EXCELLENT MECHANICAL PROPERTIES MAKE IT A MATERIAL OF CURRENT INTEREST. SINCE MATERIAL PROPERTIES AND NONLINEAR OPTICAL PROPERTIES ARE DEPENDENT UPON THE PROCESS CONDITIONS FOR SAMPLE PREPARATION IT IS IMPORTANT TO DETERMINE THE NONLINEAR OPTICAL EFFECTS AS A FUNCTION OF PROCESS CONDITIONS. THE WORK PROPOSED HERE WILL BE TO EVALUATE THE THIRD ORDER NONLINEAR OPTICAL SUSCEPTIBILITY OF PBT AS A FUNCTION OF FILM PROCESS CONDITIONS. IT IS EXPECTED THAT HIGHER VALUES OF  $X(3)$  WILL BE OBTAINED AS PROCESS VARIABLES ARE OPTIMIZED.

FOSTER-MILLER INC

AF

\$ 49,870

350 SECOND AVE

WALTHAM, MA 02254

HARRIS GOLD

TITLE:

SURFACTANT-ENHANCED STRIPPING OF VOLATILE ORGANIC CONTAMINANTS  
FROM GROUNDWATER

T 298 OFFICE: AFESC/RDXP

THE CONTAMINATION OF GROUNDWATER BY VOLATILE ORGANIC CONTAMINANTS IS



FISCAL YEAR 1986

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A NATIONAL PROBLEM OCCURRING IN ALL PARTS OF THE UNITED STATES. THE AIR FORCE HAS BEEN A LEADER IN INVESTIGATING PACKED-TOWER AERATION TO REMOVE VOCs FROM GROUNDWATER. IT HAS BEEN SPECULATED THAT THE PERFORMANCE OF THESE STRIPPING COLUMNS CAN BE IMPROVED BY ADDING SURFACTANTS TO THE WATER TO INCREASE THE WETTED PACKING SURFACE. THE PRIMARY OBJECTIVE OF THE PROPOSED PROGRAM IS TO EXPERIMENTALLY DETERMINE THE EFFECTS THAT SURFACTANTS IMPOSE ON THE PARTITIONING BEHAVIOR OF VARIOUS ORGANICS BETWEEN THE GAS AND LIQUID PHASES AND ON THE HYDRODYNAMICS OF PACKED GAS/LIQUID CONTACTORS. A SECOND OBJECTIVE IS TO INVESTIGATE THE FEASIBILITY OF A NOVEL NEW CONCEPT TO INCREASE THE WETTABILITY OF PACKING SURFACES BY IMMOBILIZING SUITABLE SPECIFIC SURFACE-ACTIVE CHEMICAL GROUPS TO THE PACKING TO INCREASE THE ENERGY OF THE PACKING SURFACE. THE PARTITIONING BEHAVIOR WILL BE QUANTIFIED THROUGH THE DETERMINATION OF HENRY'S LAW CONSTANTS BY VAPOR-LIQUID EQUILIBRIUM MEASUREMENTS, WHILE THE HYDRODYNAMIC BEHAVIOR AND FEASIBILITY OF SURFACTANT-ENHANCED STRIPPING WILL BE DETERMINED IN PACKED GAS STRIPPING COLUMNS WITH AND WITHOUT SURFACTANT ADDITION OR SURFACE-MODIFIED PACKINGS.

FOSTER-MILLER INC  
350 SECOND AVE  
WALTHAM, MA 02254  
RICHARD LUSIGNEA

NAVY

\$ 50,505

## TITLE:

PHOTODEPOSITION OF FINE LINE COPPER CONDUCTORS FOR HIGH DENSITY  
MULTILAYER PRINTED WIRING BOARDS

T 129

OFFICE: NWC/SSPO

IMPROVEMENTS IN VERY LARGE SCALE INTEGRATED CIRCUITS (VLSIC) AND THE DEVELOPMENT OF VERY HIGH SPEED INTEGRATED CIRCUITS (VHIC) COUPLED WITH THE SHIFT TO DIRECT SURFACE MOUNTING (DSM) OF CERAMIC CHIP CARRIERS ARE PUSHING THE LIMITS OF EXISTING MULTILAYER PRINTED WIRING BOARD (PWB) CONSTRUCTIONS. NEW SUBSTRATE MATERIALS AND METHODS FOR CREATING FINE LINE METAL CONDUCTORS ARE NEEDED. THE OBJECTIVE OF THIS PROGRAM IS TO DETERMINE THE FEASIBILITY OF CREATING COPPER CONDUCTORS WITH A MAXIMUM WIDTH OF 2 MILS WITH SPACES BETWEEN CONDUCTORS OF NO GREATER THAN 2 MILS WHICH CAN BE APPLIED TO MATERIALS SUITABLE FOR A MULTILAYER CONSTRUCTION AND THE ABILITY TO FUNCTION IN A MILITARY ENVIRONMENT WITHOUT DEGRADATION. IN CONJUNCTION WITH SHIPLEY COMPANY, FMI WILL MEASURE THE MECHANICAL AND ELECTRICAL PROPERTIES OF THIS NEW PROCESS USING AN EXISTING EPOXY GLASS SUBSTRATE AND FABRIC-

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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ATE A NUMBER OF MULTIPLE LAYER TEST SAMPLES. PROJECTIONS OF EVEN MORE IMPROVED PERFORMANCE WILL BE MADE USING ORDERED POLYMER SUBSTRATE MATERIALS UNDER DEVELOPMENT OF FMI.

FOSTER-MILLER INC 350 SECOND AVE WALTHAM, MA 02254 RICHARD W LUSIGNEA TITLE: LIQUID CRYSTAL POLYMERS FOR ADVANCED INTERCONNECT SUBSTRATES T 137 OFFICE: NWSC	NAVY	\$ 51,393
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LIQUID CRYSTAL POLYMERS PROCESSED FROM ANISOTROPIC MELTS CAN BE USED FOR CIRCUIT SUBSTRATES TO SOLVE PACKAGING PROBLEMS FACING HIGH PERFORMANCE INTERCONNECT BOARD TECHNOLOGY. RECENT ADVANCES IN SMT (SURFACE MOUNT TECHNOLOGY), MULTILAYER BOARD CONSTRUCTION, AND HIGH SPEED DENSELY PACKED CIRCUITS HAVE OUTSTRIPPED THE DEVELOPMENT OF SUBSTRATES USED TO CONNECT MICROELECTRIC COMPONENTS. CERAMIC MATERIALS HAVE PLAYED AN IMPORTANT ROLE, BUT ARE TOO FRAGILE FOR MANY APPLICATIONS AND ARE CURRENTLY HAMPERED BY COMPLEX HIGH TEMPERATURE MANUFACTURING PROCESSES. XYDAR IS A LIQUID CRYSTAL POLYMER WHICH HAS THE MECHANICAL, THERMAL AND ELECTRICAL PROPERTIES NEEDED TO REPLACE CERAMIC MATERIALS. MOREOVER, IT CAN BE MELT-PROCESSED WHICH GREATLY IMPROVES MANUFACTURABILITY AND ALLOWS APPLICATIONS NOT POSSIBLE WITH CERAMICS (THIN FLEXIBLE CIRCUITS, USE OF PIN GRID ARRAYS, ETC.). THE PROPOSED PROGRAM WILL EVALUATE THE FEASIBILITY OF PROCESSING XYDAR INTO FILM AND USING IT AS AN ELECTRONIC SUBSTRATE. BECAUSE OF HIGH DEGREE OF MOLECULAR ORDER, THE COEFFICIENT OF THERMAL EXPANSION CAN BE MATCHED TO SMDS BY MEANS OF CONTROLLED BIAXIAL ORIENTATION OF XYDAR FILMS. BONDING OF CONDUCTING PATHS AND LAMINATION OF MULTIPLE LAYERS WILL BE EVALUATED.

FOSTER-MILLER, INC 350 SECOND AVE WALTHAM, MA 02254 ROGER DEMLER TITLE: SLIDING SEAL TO PERMIT ENHANCED HEAT DISSIPATION FROM ADVANCED MOVING RADIATORS T 5 OFFICE:	SDIO	\$ 49,935
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REJECTION OF LARGE QUANTITIES OF HEAT FROM FUTURE SPACECRAFT WILL

FISCAL YEAR 1986

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REQUIRE ADVANCED, LIGHTWEIGHT RADIATORS TO REDUCE THEIR SPECIFIC WEIGHT. MOVING RADIATORS, SUCH AS THE MOVING BELT RADIATOR (MBR), ARE A CLASS OF ADVANCED UNITS IN WHICH THE RADIATING SURFACE IS BROUGHT IN TO THE HEAT SOURCE AND THEN RETURNED TO SPACE WHERE IT DISSIPATES HEAT BY RADIATION. ONE IMPEDIMENT TO THEIR USE IS THE POTENTIAL FOR POOR HEAT TRANSFER FROM THE HEAT SOURCE TO THE RADIATOR UNLESS AN INTERFACE HEAT TRANSFER FLUID IS EMPLOYED. SUCH ENHANCERS WILL TEND TO ADHERE TO THE RADIATOR LEADING TO EVAPORATION OF THE FLUID AND THEN THE CONDENSATION ON SENSOR SURFACES. THE OBJECTIVE OF THE PROPOSED EFFORT IS TO INVESTIGATE THE FEASIBILITY OF DEVELOPING A LIQUID SLIDING SEAL TO RETAIN HEAT TRANSFER FLUIDS WITHIN THE HEAT EXCHANGER REGION OF ADVANCED MOVING RADIATORS. THE CONCEPT RELIES ON FLUID SURFACE TENSION AND A NOVEL BODY FORCE TO OVERCOME SHEAR AND PRESSURE FORCES APPLIED BY BELT MOTION AND THE FLUID VAPOR RESPECTIVELY. THE SUCCESSFUL DEMONSTRATION OF THE SEAL WILL PERMIT THE USE OF A FLUID BATH TO TRANSFER HEAT TO A MOVING RADIATOR WITHOUT THE ADVERSE EFFECTS OF FLUID LOSS AND COMPONENT CONTAMINATION.

FOSTER-MILLER, INC 350 SECOND AVE WALTHAM, MA 02254 ANDREW C HARVEY TITLE: PLASTIC/ELASTOMERIC CONTACT CONDUCTANCE RESEARCH FOR SPACECRAFT MOVING BELT RADIATOR T 4 OFFICE:	SDIO	\$ 49,952
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A MOVING BELT SPACE RADIATOR CAN BE VERY LOW IN WEIGHT PROVIDED THAT HEAT CAN BE PUT INTO THE BELT WITH LITTLE HEAT TRANSFER RESISTANCE. THIS PROJECT WILL RESEARCH PLASTIC/ELASTOMERIC MATERIAL, WITH HIGH CONDUCTIVITY AND COMPLIANCE FOR HEAT TRANSFER FROM A HOT ROLLER INTO A BELT. DESIGN CONCEPTS AND APPLICATIONS WILL BE EXPLORED TO CAPITALIZE ON THE BELT RADIATOR VIRTUES OF LOW WEIGHT, TRANSIENT THERMAL CAPACITANCE, STOWABILITY AND COMPACTNESS DURING LAUNCH.

FOSTER-MILLER, INC 350 SECOND AVE WALTHAM, MA 02254 RICHARD W LUSIGNEA TITLE: NET SHAPE TUBULAR STRUCTURES FROM ORDERED POLYMERS T 11 OFFICE:	SDIO	\$ 65,592
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SOLUTION PROCESSED ORDERED (LIQUID CRYSTAL) POLYMERS CAN BE COMBINED

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>WITH INTERPENETRATING NETWORKS (IPNS) TO PRODUCE MATERIALS WITH PROPERTIES IMPORTANT TO SDI APPLICATIONS: DIMENSIONAL STABILITY, HIGH SPECIFIC STIFFNESS, GOOD STRUCTURAL DAMPING, HIGH TEMPERATURE CAPABILITY, AND ENVIRONMENTAL RESISTANCE. OUR APPROACH IS TO EXPLOIT THE MICROFIBRILLAR NETWORK FORMED DURING PROCESSING OF THIN-WALLED ORDERED POLYMER TUBES, IN CONJUNCTION WITH A VARIETY OF IPN MATERIALS. THIS WILL ALLOW FABRICATION OF THIN-WALLED NET-SHAPED TUBES WITH THE PROPERTIES OF HIGH PERFORMANCE COMPOSITE MATERIALS, BUT WITHOUT THE FABRICATION STEPS OR PROBLEMS ASSOCIATED WITH DISCRETE FIBER AND MATRIX COMPONENTS. THE PROPOSED PROGRAM WILL EVALUATE THE FEASIBILITY OF TUBE PROCESSING METHODS AND THE PROPERTIES OF ORDERED POLYMER IPN MATERIALS. PBT (POLY P-PHENYLENE BENZOBISTHIAZOLE) IS CURRENTLY THE MOST TECHNICALLY ADVANCED LYOTROPIC ROD-LIKE POLYMER, AND WILL BE USED IN THE PROPOSED PROGRAM.</p>		
FOSTER-MILLER, INC 350 SECOND AVE WALTHAM, MA 02254 JOHN MCCOY TITLE: SDI ORDERED POLYMER SPACE MIRRORS T 1 OFFICE:	SDIO	\$ 67,346
<p>THE PROPOSED PROGRAM WILL DEVELOP PBT (POLY P-PHENYLENE BENZOBISTHIAZOLE) ORDERED POLYMERS, TOGETHER WITH SOL-GEL GLASS TO PRODUCE AN OPTICAL QUALITY COATING ON A DIMENSIONALLY STABLE SUBSTRATE. THIS MATERIAL WILL BE USED IN HIGH QUALITY MIRRORS FOR SDI APPLICATIONS INCLUDING DEW AND SURVEILLANCE. THE PBT WILL PROVIDE DIMENSIONAL STABILITY (NEAR-ZERO CTE), STIFFNESS, TOUGHNESS AND GOOD STRUCTURAL DAMPING, WHILE THE SOL-GEL GLASS WILL PROVIDE AN OPTICAL QUALITY SURFACE - EITHER BY MEANS OF CONTROLLED CASTING OR PRECISION MACHINING. TECHNIQUES DEVELOPED IN PHASE I WILL BE AMENABLE TO SCALE-UP AND RAPID COST-EFFECTIVE MIRROR FABRICATION.</p>		
FOUR C ENTERPRISES INC 74 FORBES AVE NEW HAVEN, CT 06512 WALTER V CIECIERSKI TITLE: HIGH-SPEED TELEMETRY DATA MULTIPLEXERS FOR DIGITAL MICROWAVE SYSTEMS FEASIBILITY STUDY T 28 OFFICE: AD	AF	\$ 47,524

FEASIBILITY STUDIES OF TWO APPROACHES FOR SENDING HIGH-SPEED TELE-

FISCAL YEAR 1986

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METRY DATA VIA DIGITAL MICROWAVE SYSTEMS ARE PROPOSED. IN THE FIRST APPROACH, TELEMETRY INPUTS ARE MULTIPLEXED INTO A T2 SIGNAL. AS MANY AS 3 OF THESE INPUTS CAN EACH HAVE RATES UP TO 1.8 Mb/s. THE SECOND APPROACH INVOLVES AN INVERSE MULTIPLEXER, WHICH SPLITS AT 1.8 Mb/s INPUT BETWEEN TWO T1 STREAMS. IN EITHER APPROACH, THE MULTIPLEXED OUTPUT MAY BE USED AS AN INPUT TO AN EXISTING MULTIPLEXER IN DIGITAL MICROWAVE TRANSMISSION SYSTEMS. REMOTE DEMULTIPLEXERS RECONSTITUTE THE ORIGINAL INPUT BIT STREAMS. AFTER ESTABLISHING PRECISE REQUIREMENTS AND PERFORMING PRELIMINARY FEASIBILITY DETERMINATIONS, ONE APPROACH WILL BE SELECTED FOR A DETAILED FEASIBILITY STUDY, INCLUDING MULTIPLEXER FRAME STRUCTURE, SYNCHRONIZATION, SYSTEM ARCHITECTURE, AND PERFORMANCE ESTIMATES. ASSUMING FEASIBILITY IS DEMONSTRATED, A FUNCTIONAL SPECIFICATION OF THE SELECTED MULTIPLEXER WILL BE GENERATED.

FREDWAL INC  
PO BOX 248 - 2211 MAIN ST/BLDG C  
BUFFALO, NY 14225  
ARTHUR A WALIER  
TITLE:  
MANPACK FOLIAGE PENETRATION RADAR  
T 12 OFFICE: USMC/LBC

NAVY \$ 85,777

FREDWAL INC. WILL DESIGN AND FABRICATE TWO LIGHTWEIGHT FOLIAGE PENETRATION BATTLEFIELD SURVEILLANCE DEVICES (FOLPEN-BSD) FOR THE UNITED STATES MARINE CORPS. THE SOLID STATE, BATTERY OPERATED RADAR WILL HAVE THE ABILITY TO DETECT A SINGLE-MAN OR VEHICLE MOVING THROUGH 300 METERS OF LIGHT TO HEAVY FOLIAGE AND 1500 METERS IN OPEN TERRAIN. THE RADAR WILL CONSIST OF A RECEIVER-TRANSMITTER UNIT, DIAPLAY-CONTROL UNIT, ANTENNA AND MAST GROUP. THE TOTAL PROPOSED SYSTEM WEIGHT WILL BE 30 POUNDS AND CAN BE CARRIED, ERECTED, AND PACKAGED BY ONE MAN IN TWELVE MINUTES. FREDWAL INC. WILL IMPLEMENT CURRENT TECHNOLOGY AND COMPONENTS UNDER THE SUPERVISION OF THE PRINCIPLE INVESTIGATOR TO MEET THE PERFORMANCE SPECIFICATIONS. THE PROPOSED SYSTEM WILL ADDRESS THE U.S. MARINE CORPS REQUIRED OPERATIONAL CAPABILITY INTELLIGENCE (ROC INT) 1.05 OF 17 MAY 1976. PRE-CONTRACT ACTIVITY STARTING IN NOVEMBER 1985 AND SCHEDULED FOR COMPLETION AT THE TIME OF AWARD WILL EXAMINE A PRELIMINARY MECHANICAL AND ELECTRICAL DESIGN PHILOSOPHY. FABRICATION AND TESTING OF TWO PROTOTYPE SYSTEMS AND THE SUBMISSION OF A FINAL REPORT WILL COMPLETE THE PROGRAM BY NOVEMBER 1986.

FISCAL YEAR 1986

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FRONTIER TECHNOLOGY INC 5266 HOLLISTER AVE - STE 215 SANTA BARBARA, CA 93111 EDWARD P JORDAN TITLE: STRATEGIC PLANNING INNOVATIONS FOR ASD/XR T 94 OFFICE: ASD/XR	AF	\$ 51,635

THE OVERALL PROGRAM GOAL IS THE DEVELOPMENT, IMPLEMENTATION, AND SUSTAINMENT FOR ASD/XR OF AN INNOVATIVE STRATEGIC PLANNING PROCESS, DESIGNED TO CORRELATE THOSE PLANNING PROCESSES INTERNAL AND EXTERNAL TO ASD WHICH ARE DIRECTED TOWARD TECHNOLOGY AND SYSTEM DEVELOPMENT. IN PHASE I, ASD/XR STRATEGIC PLANNING REQUIREMENTS WILL BE ANALYZED AND DOCUMENTED. A STEP-BY-STEP PLANNING PROCEDURE WILL BE FULLY DEMONSTRATED, REFINED, AND IMPLEMENTED IN PHASE II, AND THE PROCEDURE SUSTAINED IN PHASE III AS AN ASD/XR PROGRAM. EXPERIENCES, TECHNOLOGIES, AND LESSONS FROM THE FALCON CENTURY PLANNING EFFORT FOR THE F-16 SPO WILL BE DRAWN ON AND ADOPTED TO ASD/XR PLANNING NEEDS AND PERSPECTIVES. SEVERAL OF THE INNOVATIVE PLANNING AND ANALYSIS CONCEPTS TO BE INTRODUCED IN PHASE I WILL PROVIDE IMMEDIATE BENEFITS TO ASD PLANNING AND ANALYSIS EFFORTS. THESE INCLUDE AN AIRCRAFT FORCE PROJECTION MODEL, SIMPLIFIED AND UNIFIED TECHNIQUES FOR TOP-LEVEL MISSION AREA ANALYSES, AND CORRELATION OF "OFFICIAL" USAF PLANNING FACTORS. THE PLANNING CONCEPT FOR SYSTEM AND TECHNOLOGY DEVELOPMENTS DESIGNED AND IMPLEMENTED UNDER THIS PROGRAM WILL BE UNIQUELY COMPREHENSIVE, UNIFIED, AFFORDABLE, AND EFFECTIVE.

FUENTEZ SYSTEMS CONCEPTS INC 11244 WAPLES MILL RD - STE G-1 FAIRFAX, VA 22030 DANIEL C SCHNEIBLE TITLE: INTERACTIVE COMPUTER PROGRAM FOR DERIVING MEASUREMENTS OF OPERATIONAL EFFECTIVENESS (MOE) FOR C3I SYSTEMS THAT USE AI TECHNIQUES T 161 OFFICE: TECOM/EPG	ARMY	\$ 49,600
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THE PROPOSED EFFORT WILL DESIGN, DEVELOP AND TEST AN INTEGRATED COMPUTER ASSISTED METHODOLOGY FOR SPECIFYING, TESTING AND EVALUATING C3I SYSTEMS THAT USE ARTIFICIAL INTELLIGENCE TECHNIQUES. SPECIFIC

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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SYSTEM REQUIREMENTS WILL BE IDENTIFIED AND ANALYZED THROUGH A SURVEY OF EXISTING AND PLANNED SYSTEMS. REQUIREMENTS DEFINITION AND DOCUMENTATION WILL BE BASED ON CLASSICAL SYSTEMS ENGINEERING APPROACH USING FUNCTIONAL MODELS PLUS NEW ANALYSIS TECHNIQUES TO DETERMINE AND DESCRIBE MEASUREABLE QUALITIES MORE NEARLY UNIQUE TO SYSTEMS THAT USE AI TECHNIQUES. SYSTEM WILL ASSIST IN GENERATION OF MEASUREMENTS OF OPERATIONAL EFFECTIVENESS THAT RELATE TO OPERATIONAL REQUIREMENT AND FUNCTIONAL EVALUATION PARAMETERS.

FUNCTIONPAK ENTERPRISES PO BOX 141217 COLUMBUS, OH 43214 S K PORWAL TITLE: A RETORTABLE NON-METALLIC SQUEEZABLE FOOD TUBE DEVELOPMENT T 137 OFFICE: NRDC	ARMY	\$ 42,900
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THIS PROGRAM WILL INVESTIGATE THE FEASIBILITY OF USING SELECTED SYMMETRICAL AND ASSYMETRICAL RETORTABLE SUBSTRATES FOR CONSTRUCTING SQUEEZABLE TUBES TO PACKAGE HIGH TEMPERATURE STERILIZED FOOD PRODUCTS. HEAT SEALABILITY AND RETORTABILITY CHARACTERISTICS OF THE SUBSTRATES WILL BE DETERMINED. PROTOTYPE FOOD TUBES WILL BE CONSTRUCTED AND TESTED.

FUTURES GROUP INC 76 EASTERN BLVD GLASTONBURY, CT 06033 T GORDON/T ANDERSON TITLE: PERFORMANCE METHODOLOGY FOR ARTIFICIAL INTELLIGENCE SYSTEMS T 16 OFFICE: DARPA	DARPA	\$ 55,184
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THIS PROPOSAL OUTLINES A TECHNIQUE FOR DEVELOPING A PERFORMANCE METHODOLOGY FOR EVALUATING ARTIFICIAL INTELLIGENCE SYSTEMS. THE METHODOLOGY PROPOSED IS BASED ON RESEARCH DONE BY THE FUTURES GROUP UNDER THE SPONSORSHIP OF THE NATIONAL SCIENCE FOUNDATION AND THE DEPARTMENT OF DEFENSE. THE METHODOLOGY, TERMED "STATE OF THE ART" (SOA) TECHNOLOGY MEASUREMENT ANALYSIS HAS BEEN SUCCESSFULLY USED TO ANALYZE AND FORECAST THE PERFORMANCE OF ADVANCED WEAPON SYSTEMS AND OTHER COMPLEX TECHNOLOGIES. THE METHODOLOGY USES INFORMATION

FISCAL YEAR 1986

SUBMITTED BY

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GATHERED FROM EXPERT SYSTEM USERS TO DEVELOP PERFORMANCE SYSTEM PARAMETERS. THE INFORMATION GATHERED IS STRUCTURED INTERVIEWS (DELPHI TECHNIQUES) AND IS ANALYZED USING A LINEAR COMBINATION OF PERFORMANCE PARAMETERS AND A WEIGHTING FACTOR DESCRIBING THE PARAMETER'S IMPORTANCE FOR A SPECIFIC TASK. THE ANALYSIS IS CARRIED OUT BY DEVELOPING A HISTORY OF THE ADVANCEMENT IN TECHNOLOGY OF THE SUBJECT. ADVANCEMENTS IN TECHNOLOGY ARE IDENTIFIED AND EXPLANATIONS FOR THEM ARE SOUGHT. FUTURE IMPEDIMENTS TO PROGRESS IN THE SUBJECT ARE IDENTIFIED. THIS METHODOLOGY HAS BEEN SUCCESSFULLY USED TO ANALYZE THE PERFORMANCE OF SUBJECTS AS DIVERSE AS INFRARED SENSOR TECHNOLOGY AND COMPUTER SOFTWARE. ALTHOUGH THE METHODOLOGY IS OPEN AND FLEXIBLE, A QUANTITATIVE ASSESSMENT OF THE TECHNOLOGY FROM THE POINT OF VIEW OF THE USER IS PRODUCED.

G2 ASSOCIATES  
12223 RAVELLE DR  
ST LOUIS, MO 63146  
G GOVERMAN

AF

\$ 41,847

TITLE:

MATE ICA STANDARD UPGRADES DEVELOPMENT  
T 87 OFFICE: ASD/AE

THE PROMULGATION OF AFR-800-23 HAS PROMPTED WIDESPREAD USE OF THE MATE SYSTEM BASELINES THROUGHOUT THE AIR FORCE. THIS WIDESPREAD ACCEPTANCE OF MATE HAS GENERATED MANY NEW REQUIREMENTS, AND WITH THEM HAS COME THE NEED TO REVIEW AND UPGRADE THE MATE ICA STANDARD. THIS EFFORT SEEKS TO RESEARCH THE WAY IN WHICH THIS STANDARD SHOULD BE UPGRADED. IT SURVEYS WEAPON SYSTEMS THAT ARE CANDIDATES FOR MATE ATE SUPPORT AND DEFINES ANY AREAS OF THE PRESENT MATE ICA STANDARD THAT REQUIRE MODIFICATION FOR THEIR SUPPORT. IT SURVEYS TEST INTERFACE TECHNOLOGY FOR APPLICABILITY TO PROVIDING THESE MODIFICATIONS, RECOMMENDS CANDIDATE UPGRADES TO THE MATE ICA STANDARD, AND PROPOSES A SCHEDULE FOR THE IMPLEMENTATION OF THESE UPGRADE MODIFICATIONS.

GAIN ELECTRONICS CORP  
22 CHUBB WY  
SOMERVILLE, NJ 08876  
DR RAYMOND DINGLE

AF

\$ 59,358

TITLE:

GALLIUM ARSENIDE DEVICE-LSI/VLSI DESIGN DEVELOPMENT  
T 119 OFFICE: AFWAL/AA

MODULATION DOPED FETS ON HETEROSTRUCTURE LAYERS (SDHT, HEMT, TEGFET,



FISCAL YEAR 1986

SUBMITTED BY

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AWARDED

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MODFET) ARE OF PRIME INTEREST FOR FUTURE HIGH SPEED CIRCUITS WITH IMPROVED PERFORMANCE CHARACTERISTICS. CIRCUITS BASED ON SDHT TECHNOLOGY HAVE DEMONSTRATED SUPERIOR PERFORMANCE IN SPEED AND SPEED-POWER PRODUCT IN DIGITAL, AS WELL AS, LOW-NOISE MICROWAVE APPLICATIONS. DIGITAL SWITCHING TIMES OF AS SHORT AS 6ps HAVE BEEN REALIZED, THE FASTEST IN ANY SEMICONDUCTOR TECHNOLOGY AND COMPARABLE TO THE FASTEST RESULTS OBTAINED IN JOSEPHSON JUNCTION CIRCUITS. EXTREMELY LOW NOISE FIGURES AND HIGH CUT-OFF FREQUENCIES INDICATE SUPERIOR ANALOG APPLICATIONS. THE EFFECTS OF RADIATION ON SDHT DEVICES HAS NOT BEEN ADDRESSED THUS FAR. MANY APPLICATIONS FOR WHICH THESE HIGH PERFORMANCE CIRCUITS ARE IDEALLY SUITED FOR, (EARLY WARNING SYSTEMS, SPACE BASED DEFENSIVE SHIELDS FOR EXAMPLE) REQUIRE OPERATION IN RADIATION CONTAMINATED ENVIRONMENTS. IT IS THIS AREA-- THE ASSESSMENT OF RADIATION EFFECTS ON SDHT DEVICES AND CIRCUITS-- THAT OUR PROPOSAL ADDRESSES.

GAIN ELECTRONICS CORP

ARMY

\$ 49,880

22 CHUBB WY

SOMERVILLE, NJ 08876

DR RAYMOND DINGLE

TITLE:

PATTERNING OF GaAs AND AlGaAs ULTRA-SUBMICRON DEVICE STRUCTURES

T 82

OFFICE: LABCOM/ETDL

THE PERFORMANCE OF DEVICES AND INTEGRATED CIRCUITS USING SELECTIVELY DOPED HETEROSTRUCTURE TRANSISTORS (SDHT) HAS INCREASED DRAMATICALLY IN THE PAST YEARS. A LARGE PART OF THAT PERFORMANCE IMPROVEMENT IS DUE TO THE REDUCED FEATURE SIZE OF THE GATE ELECTRODE. RECORD SWITCHING TIMES (6 ps) HAVE BEEN ACHIEVED USING GATE LENGTHS OF 0.3 MICROMETERS (um). SHORTER GATE LENGTHS POTENTIALLY WILL HAVE EVEN SHORTER SWITCHING TIMES WITH NOVEL EFFECTS SUCH AS VELOCITY OVERSHOOT EXPECTED. GAIN ELECTRONICS CORPORATION (GAIN) PROPOSES TO LAY THE FOUNDATION FOR PROCESSES ULTIMATELY REACHING MINIMUM DIMENSIONS OF LESS THAN 0.1 um. IN PHASE I OF THIS LONG TERM PROJECT WE INTEND TO DEVELOP TEST PATTERNS FOR THE INVESTIGATION OF SDHT DEVICE SCALING. SUBMICRON PATTERNS WILL BE EXPOSED BY A DIRECT-WRITE E-BEAM SYSTEM AND METHODS OF PATTERN TRANSFER (WET CHEMICAL ETCH, REACTIVE ION ETCH, ION MILLING) WILL BE EVALUATED FOR ACCURACY AND PRECISION IN TRANSFERRING THE PATTERN FROM RESIST TO THE WAFER AND FOR CAPABILITY OF MAINTAINING HIGH ASPECT RATIOS OF THE ETCH. AT THE END OF THE PHASE I PERIOD, GAIN WILL BE READY TO APPLY RELEVANT PATTERN TRANSFER

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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METHODS TO THE ULTRA-SUBMICRON DEVICE APPLICATIONS OF SDHT DEVICES  
AND CIRCUITS.

GALILEO ELECTRO-OPTICS CORP GALILEO PK STURBRIDGE, MA 01518 W BRUCE FELLER TITLE: ELECTRON MULTIPLIER STABILITY T 111 OFFICE: AFWAL/AA	AF	\$ 48,179
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THIS PROJECT ADDRESSES IMPROVEMENTS IN MICROCHANNEL PLATE (MCP) LONG TERM GAIN STABILITY THROUGH REDUCTION OF ELIMINATION OF MECHANISMS CAUSING IRREVERSIBLE GAIN LOSS. IMPROVEMENTS IN OPERATIONAL LIFETIME WILL RESULT. MCP GAIN INSTABILITY CAN BE CATEGORIZED INTO SHORT TERM AND LONG TERM LOSSES. THE SHORT TERM INSTABILITY IS CAUSED BY ADSORPTION AND DESORPTION OF GAS MOLECULES LOOSELY BOUND ONTO MICROCHANNEL WALLS WHICH CAN BE ELIMINATED BY INITIAL OUTGASSING AND STABILIZATION PROCEDURES. LONG TERM GAIN INSTABILITY IS MORE SERIOUS AND IS IRREVERSIBLE. IT IS A DIRECT FUNCTION OF ACCUMULATED OUTPUT CHARGE. SEVERAL UNCONFIRMED MECHANISMS HAVE BEEN POSTULATED AS CAUSING THE LONG TERM LOSS. THESE MECHANISMS REDUCE TO A LOSS IN THE SECONDARY ELECTRON EMISSION YIELD, AND/OR A CHANGE IN THE CHANNEL WALL CONDUCTIVITY. DATA EXISTS ON THE CHANGE IN SECONDARY YIELD, BUT NOT ON THE CONDUCTIVITY CHANGE. THIS WORK WILL MEASURE CONDUCTIVITY CHANGE WITH PROLONGED MCP OPERATION AND WILL DETERMINE THE RELATIVE IMPORTANCE OF THIS CHANGE AND THE SECONDARY YIELD CHANGE IN THE GAIN DEGRADATION PROCESS BY PERFORMING A COMPUTER SIMULATION OF MCP GAIN BEHAVIOR. THIS WILL LEAD TO THE TESTING OF PROCESS CHANGES IN PHASE II TO MINIMIZE OR ELIMINATE LONG TERM MCP GAIN LOSS DUE TO AGING.

GAS CURTAIN TECHNOLOGY PENN CENTRE PLAZA QUAKERTOWN, PA 18951 WARNER H WITMER TITLE: GAS CURTAIN SOLDERING APPARATUS T 149 OFFICE: NWSC	NAVY	\$ 65,989
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ELECTRONIC COMPONENT PACKING DENSITY IS INCREASING RAPIDLY BECAUSE OF

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>REQUIREMENTS FOR GREATER RELIABILITY, GREATER RESISTANCE TO VIBRATION AND SHORTER SIGNAL PATH. SMT TECHNIQUES, REPRESENTING STATE-OF-THE-ART, REQUIRE ADVANCED SOLDERING TECHNOLOGY INCLUDING DUAL-WAVE, IR, ULTRASONIC AND BLANKETED VAPOR PHASE SOLDERING. THE SHEER NUMBER OF SOLDER CONNECTIONS IN DAIC/PC WILL REQUIRE NEW EXTREMELY HIGH-YIELD, HIGH-RELIABILITY SOLDER ATTACHMENT EQUIPMENT. A SOLDER JOINT CONNECTS A COMPONENT TO A PC BOARD BOTH ELECTRICALLY AND MECHANICALLY. THEREFORE, SOLDER INTEGRITY IS A CRITICAL FACTOR IN MILITARY EQUIPMENT RELIABILITY. IN THIS PROPOSAL UNIQUE GAS CURTAIN SOLDERING EQUIPMENT IS DESCRIBED THAT PRODUCES STRONG, RELIABLE, REPRODUCABLE SOLDER BONDS WITHOUT THE USE OF CHEMICAL FLUXES. ELIMINATION OF FLUXES AND FLUX REMOVAL WILL BE A MAJOR ADVANCE BECAUSE FLUXES ARE ABIETIC ACIDS THAT CAN LATER CAUSE RELIABILITY PROBLEMS IN SMT AND DAIC/PC ASSEMBLIES. INCREASED THROUGHPUT IS ANOTHER MAJOR GOAL OF THE PROGRAM. AN INDUSTRY SURVEY OF 720 COMPANIES HAS BEEN UNDERTAKEN WITH RESULTS SHOWING OVERRIDING INTEREST AND NEED FOR EQUIPMENT OF THE TYPE PROPOSED.</p>		

GENERAL DIGITAL INDUSTRIES INC 7702 GOVERNORS DR HUNTSVILLE, AL 35805 RICHARD E REEVES TITLE: A PRACTICAL MODEL OF AN EXPERT ADAPTIVE CONTROL SYSTEM FOR SHIPYARD WELDING APPLICATIONS T 66 OFFICE: NAVSEA	NAVY	\$ 59,027
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IN AN EFFORT TO COMPENSATE FOR THE DECLINING SKILL LEVELS OF SHIPYARD WELDERS, THIS PROGRAM RESEARCHES THE FEASIBILITY OF BUILDING AN ADAPTIVE WELD CONTROL SYSTEM USING A RULE-BASED EXPERT SYSTEM AND APPROPRIATE SENSORS. THE SHIPYARD WELDING PROCESS THAT CAN BENEFIT MOST FROM SUCH A CONTROL SYSTEM WILL BE IDENTIFIED. THE KEY DETERMINANTS OF WELD QUALITY AND THE TRANSFER FUNCTIONS THAT RELATE THEM WILL BE ESTABLISHED. A PRACTICAL MODEL OF THE WELD PROCESS AND EXPERT SYSTEM WILL BE DEVELOPED AND WILL BE USED TO PROJECT THE QUALITY, CORRECTNESS AND SPEED OF RESPONSE OF A FULLY-DEVELOPED CONTROL SYSTEM.

GENERAL SCIENCES INC 655 S GRAVES RD PLYMOUTH MEETING, PA 19462 DR PETER D ZAVITSANOS TITLE: LASER HARDENING BY INTERMETALLIC BONDING T 4 OFFICE: AM/SBIR	DNA	\$ 73,024
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THE USE OF HIGHLY EXOTHERMIC SELF PROPAGATING INTERMETALLIC REACTIONS

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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IN PROPOSED TO BOND TOGETHER LOW COST ANISTROPIC GRAPHITIC MATERIALS WHICH HAVE SHOWN PROMISE AS LASER RESISTANT MATERIALS DUE TO HIGH REFLECTIVITY AND HIGH HEAT OF VAPORIZATION. IN ADDITION SEVERAL TECHNIQUES ARE PROPOSED IN ORDER TO DEVELOP HIGHLY REFLECTIVE RE-FRACTORY COATINGS FOR GRAPHITIC SUBSTRATES, AND FINISHED SHAPES OF REFLECTIVE HIGH TEMPERATURE CERAMICS. SCREENING WILL BE CONDUCTED IN AN EFFORT TO EVALUATE THE EFFECTIVENESS OF THE PROPOSED BONDING TECHNIQUES AND THE PERFORMANCE OF THE MATERIAL SAMPLES IN TERMS OF LASER ABLATION(Q\*) BACKSURFACE TEMPERATURE RISE AND ADHERENCE TO A TYPICAL BOOSTER MATERIAL SUBSTRATE SUCH AS ALUMINUM. THE MECHANISMS OF PROTECTION AND/OR FAILURE WILL BE ADDRESSED AND RECOMMENDATIONS WILL BE MADE FOR THE FUTURE DIRECTION OF THIS TECHNOLOGY IN TERMS OF SERVING THE SDI OBJECTIVES AS A PRACTICAL MEANS OF PROTECTING BOOSTERS FROM LASER RADIATION.

GENERAL TECHNOLOGY APPLICATIONS INC  
12343-D SUNRISE VALLEY DR  
RESTON, VA 22091  
DR ALBERT F HADERMANN

AF

\$ 48,767

## TITLE:

CONTINUOUS LOW COST PROCESSING TECHNIQUES FOR MANUFACTURING OF  
SOLID ROCKET PROPELLANT

T 80

OFFICE: AFRPL/TSTR

THE UNITED STATES AIR FORCE IS SEEKING A SIMPLE, LOW COST METHOD FOR MANUFACTURING LARGE SOLID ROCKET MOTORS. LOW COST CONTINUOUS PROCESSING EMPLOYED IN THE COMMERCIAL PLASTICS INDUSTRY SHOULD OFFER THIS POTENTIAL. HOWEVER, THERE ARE UNIQUE PROBLEMS AND REQUIREMENT IN MANUFACTURING PROPELLANTS AND COMMERCIAL CONTINUOUS PROCESSING TECHNIQUES HAVE NOT YET FOUND THEIR WAY INTO PROPELLANT MANUFACTURING. GTA HAS DISCOVERIES AND DEVELOPMENTS RELATING TO THE PROCESSING OF COMPLEX COMPOSITES WHICH ADDRESS THE SPECIFIC PROBLEMS PRESENTED BY CONTINUOUS PROCESSING PROPELLANTS. CONCEPT FEASIBILITY HAS BEEN DEMONSTRATED IN A CONTRACT FUNDED BY DARPA. GTA PROPOSES TO DEMONSTRATE THE TECHNICAL FEASIBILITY OF THE USE OF THESE PROCESSES FOR LOW COST CONTINUOUS PROCESSING OF LARGE SOLID ROCKET MOTORS. THE GTA TECHNOLOGY PROVIDES AN OPPORTUNITY FOR SIMPLE, LOW COST CONTINUOUS PROCESSING OF THERMOSET PROPELLANTS NOT POSSIBLE WITH OTHER CONCEPTS. THE PRINCIPAL ADVANTAGE IS THE ABILITY TO PRECISELY BLEND ALL INGREDIENTS AS A BATCH IN A LOW SHEAR, NON-REACTIVE STATE. THE HOMOGENEOUSLY PREBLENDED MATERIAL IS FED INTO A CONTINUOUS PROCESSOR

FISCAL YEAR 1986

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AMOUNT  
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WHERE MINIMAL WORK PRODUCES A CASTABLE SLURRY. COMPLEX AND EXPENSIVE CONTINUOUS METERING SYSTEMS ARE NOT REQUIRED. WORKING TIME OF THE INGREDIENTS IN A REACTIVE STATE IS LESS THAN ONE MINUTE, IN A RELATIVELY LOW SHEAR SYSTEM.

GEO-CENTERS INC

NAVY

\$ 49,986

7 WELLS AVE

NEWTON CENTRE, MA 02159

DR MARC D MERMELSTEIN

TITLE:

MINIATURIZED SOLID STATE MAGNETIC SENSOR CHIP

T 51

OFFICE: NAVSEA

THE DEVELOPMENT OF A MINIATURIZED ALL SOLID STATE MAGNETIC SENSOR CHIP IS PROPOSED. THE SENSOR EXPLOITS THE MAGNETOELASTIC RESPONSE OF AN AMORPHOUS METAL FILM. PHASE I RESEARCH IS DIRECTED TOWARDS ESTABLISHING THE PRINCIPLE OF OPERATION OF THE PROPOSED SOLID STATE MAGNETIC SENSOR, IDENTIFYING THE CRUCIAL MATERIAL PARAMETERS THAT DETERMINE THE MAGNETIC SENSOR PERFORMANCE, AND DETERMINING THE PROPOSED SENSOR'S DETECTION CAPABILITIES.

GEO-CENTERS INC

NAVY

\$ 49,974

7 WELLS AVE

NEWTON CENTRE, MA 02159

DR MARC D MERMELSTEIN

TITLE:

FIBER OPTIC MAGNETOMETER WITH 10 TO THE -12 TESLA/DIVIDED BY Hz  
DETECTION CAPABILITY

T 63

OFFICE: NAVSEA

THE DEVELOPMENT OF A HIGH SENSITIVITY POLARIMETRIC FIBER OPTIC MAGNETOMETER CAPABLE OF DETECTING LOW-FREQUENCY MAGNETIC FIELDS OF 10 (-12) TESLA/DIV BY Hz IS PROPOSED. THE PHASE I RESEARCH EFFORT IS PRIMARY DIRECTED TOWARD THE DEVELOPMENT OF A FIBER OPTIC MAGNETO-ELASTIC TRANSDUCER, OF SUFFICIENT SENSITIVITY, WHICH CONVERTS THE SIGNAL MAGNETIC FIELD TO A STRAIN AND TRANSFERS THE STRAIN TO THE CORE OF THE OPTICAL FIBER. THE NOVEL TRANSDUCER DESIGN CONSISTS OF A MAGNETOSTRICTIVE AMORPHOUS METAL RIBBON CONFIGURATED IN A THIN SHELL GEOMETRY AROUND WHICH IS WOUND A SPECIALIZED SELF-ORIENTING HIGH-BIREFRINGENCE FIBER. FIELD-INDUCED STRAINS IN THE MAGNETOSTRICTIVE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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THIN-SHELL ARE TRANSFERRED TO THE CORE OF THE OPTICAL FIBER AND INDUCE FLUCTUATIONS IN THE FIBER BIREFRINGENCE. THESE BIREFRINGENCE FLUCTUATIONS ARE SUBSEQUENTLY CONVERTED TO A SIGNAL VOLTAGE BY THE FIBER OPTIC POLARIMETRIC INTERFEROMETER AND THE PHOTODETECTOR. THE PHASE I RESEARCH EFFORT IS SPECIFICALLY DIRECTED TOWARD THE DESIGN, CONSTRUCTION, AND OPTIMIZATION OF THE FIBER OPTIC MAGNETOELASTIC TRANSDUCER. A SUCCESSFUL CONCLUSION OF THE PHASE I RESEARCH EFFORT WILL BE THE DEVELOPMENT OF A FIBER OPTIC MAGNETOELASTIC TRANSDUCER WHOSE MAGNETIC FIELD SENSITIVITY IS CONDUCTIVE TO THE DETECTION OF LOW FREQUENCY MAGNETIC FIELDS OF 10 (-12) TESLA/ DIV BY Hz.

GEO-CENTERS INC 7 WELLS AVE NEWTON CENTRE, MA 02159 EDWARD D PETROW TITLE: NEW SYNTHETIC ROUTES FOR ENERGETIC MATERIALS T 4 OFFICE: ARDC/SMCAR	ARMY	\$ 49,992
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THE SYNTHESIS OF NITRO DERIVATIVES OF HIGHLY STRAINED CAGE COMPOUNDS WHICH MAY ULTIMATELY PAVE THE WAY TO NEW, HIGHLY ENERGETIC MATERIALS FORMULATIONS HAS RECEIVED CONSIDERABLE ATTENTION IN RECENT YEARS. POLYNITRO POLYHEDRANES ARE PARTICULARLY ATTRACTIVE AS ALTERNATIVE INSENSITIVE HIGH EXPLOSIVES (IHE) DUE TO THEIR HIGH CARBON TO HYDROGEN ATOM RATIOS, HIGH DENSITIES (UP TO 1.40 g/cc) AND HIGH NET VOLUMETRIC HEATS OF COMBUSTION. CYCLOBUTADIENE IRON TRICARBONYL AND ITS DERIVATIVES FORM AN IMPORTANT GROUP OF PRECURSORS TO SUCH SYSTEMS. IT IS PROPOSED IN THIS EFFORT, TO SYNTHESIZE A SERIES OF NITRATED CYCLOBUTADIENE IRON TRICARBONYL COMPLEXES. THESE WILL BE CONVERTED TO CAGE COMPOUNDS BY DIMERIZATION/PHOTOCYCLOADDITION AND/OR CONDENSATION WITH DIENOPHILES FOLLOWED BY PHOTOCYCLOADDITION. THIS WOULD RESULT IN THE FORMATION OF CAGE COMPOUNDS ALREADY BEARING NITRO GROUPS THUS OBTAINING THE DIFFICULT STEP OF CONVERTING OTHER FUNCTIONAL GROUPS TO NITRO SUBSTITUENTS.

GEO-CENTERS INC 7 WELLS AVE NEWTON CENTRE, MA 02159 THOMAS G DIGIUSEPPE TITLE: HIGH PRESSURE FIBER OPTIC SENSOR FOR NUCLEAR TEST INSTRUMENTATION T 3 OFFICE: AM/SBIR	DNA	\$ 49,289
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THE GOAL OF THIS PHASE I EXPERIMENTAL EFFORT IS TO DEMONSTRATE THE

FISCAL YEAR 1986

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FEASIBILITY OF USING AN OPTICAL GLASS AS A SENSING ELEMENT FOR VERY HIGH PRESSURE MEASUREMENTS. CURRENTLY, PIEZO-ELECTRIC GAUGES ARE TYPICALLY USED. AS THESE SENSORS ARE ELECTRICAL IN NATURE, THEY ARE ADVERSELY AFFECTED BY ELECTROMAGNETIC INTERFERENCE (EMI) WHICH IS CREATED IN A NUCLEAR EVENT. THE PROPOSED FIBER OPTIC SENSOR BASED UPON THE PHOTOELASTIC EFFECT IS INHERENTLY IMMUNE TO EMI. IN ADDITION, SUM-DIFFERENCE OUTPUT DETECTION METHODS WILL RESULT IN A FIBER OPTIC SENSOR WHICH IS LESS SENSITIVE THAN A SINGLE OUTPUT SENSOR TO THE EFFECTS OF NUCLEAR RADIATION (FIBER DARKENING), AS THE MONITORING OF BOTH OUTPUT POLARIZATIONS ALLOWS FOR THE SENSOR OUTPUT TO BE TRANSMITTED INTENSITY INVARIANT. BY INCORPORATING AN OPTICAL GLASS AS THE PHOTOELASTIC SENSING ELEMENT, A FIBER OPTIC SENSOR WITH A LINEAR SENSING RANGE OF APPROXIMATELY 12 kBAR AND AN AC BANDWIDTH CAPABILITY APPROACHING 1 MHz CAN BE REALIZED.

GEOCHEMICAL SERVICES INC	AF	\$ 50,000
2741 TOLEDO ST - STE 201		
TORRANCE, CA 90503		
WILLIAM HENDERSON		

## TITLE:

DEPTH PROFILES AND BULK ANALYSIS OF SEMICONDUCTOR MATERIALS USING ICP MASS SPECTROSCOPY WITH ELECTROTHERMAL ATOMIZATION

T 55 OFFICE: RADC/DOR

A NOVEL APPROACH TO SENSITIVE DIRECT ANALYSIS OF III-V COMPOUNDS AND OTHER SEMICONDUCTOR MATERIALS IS PROPOSED. FEASIBILITY DEPENDS ON THE SUCCESSFUL MODIFICATION OF HARDWARE AND SOFTWARE OF A COMMERCIALY AVAILABLE INDUCTIVELY COUPLED PLASMA MASS SPECTROMETER (ICP/MS). FOR ROUTINE BULK ANALYSIS OF SEMICONDUCTOR SUBSTRATES, EPITAXIAL FILMS, DOPANTS, OR SOURCE MATERIALS, THE FOLLOWING CONCEPT IS PROPOSED. A SPECIALLY DESIGNED ELECTROTHERMAL ATOMIZER WOULD CONTAIN THE SOLID OR LIQUID SAMPLE AND CUSTOM SOFTWARE WOULD BE WRITTEN TO COLLECT ANALYTICAL DATA AS A FUNCTION OF THE THREE DIMENSIONS OF ION COUNTS, ATOMIC MASS, AND FURNANCE TEMPERATURE. BY THE PROPER CHOICE OF THE CARRIER GAS PASSING OVER THE SAMPLE, SEPARATION OF THE VARIOUS ELEMENTS CONTAINED IN THE SAMPLE SHOULD BE ACHIEVABLE IN THE THIRD DIMENSION OF TEMPERATURE. SPATIAL SEPARATION IN THE TEMPERATURE DIMENSION COULD BE USED TO ELIMINATE MANY MASS INTERFERENCE. DETECTION LIMITS FOR MOST ELEMENTS OF THE PERIODIC CHART ARE EXPECTED TO RANGE BETWEEN 0.01 AND 0.1 ppb. DEPTH PROFILES SHOULD BE ACHIEVABLE BY MASKING OFF THE AREA TO BE PROTECTED AND MOUNTING THE

FISCAL YEAR 1986

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SAMPLE INSIDE THE ATOMIZER TUBE. THE CARRIER GAS WOULD THEN BE PASSED OVER THE SURFACE OF THE MOUNTED SAMPLE AT A TEMPERATURE SUFFICIENT TO ATOMIZE THE ELEMENTS OF INTEREST. THE TIME DIMENSION OF THIS THREE DIMENSIONAL DATA SET OF ION COUNTS, ATOMIC MASS, AND TIME COULD BE CALIBRATED TO DEPTH AND A PROFILE OF EACH ELEMENT AND ITS ISOTOPE RATIOS COULD BE CREATED WITH SUB-ppb SENSITIVITY.

GEOMET TECHNOLOGIES INC 20251 CENTURY BLVD GERMANTOWN, MD 20874 JOHN MACWATERS TITLE: CHEMICAL VULNERABILITIES OF ARMORED VEHICLES T 15 OFFICE: DARPA	DARPA	\$ 49,914
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DEFEAT OF COMBAT VEHICLES IS PRINCIPALLY SOUGHT THROUGH DIRECT-FIRE WEAPONS AND THE EFFECTS OF CONVENTIONAL MUNITIONS. THE DESIRED EFFECT IS FIRST TO ACHIEVE A CATASTROPHIC KILL (K-KILL) OR, FAILING THAT, TO INFLICT A FIREPOWER OR MOBILITY KILL. ADVANCEMENT IN ARMOR PROTECTION HAS SHOWN, HOWEVER, THAT ANTIARMOR WEAPONS/MUNITIONS CAN BECOME marginally effective in a very short period. CHEMICAL AGENTS/MUNITIONS HAVE HISTORICALLY BEEN EMPLOYED TO DEBILITATE THE VEHICLE CREW, OR TO LIMIT THEIR COMBAT EFFECTIVENESS BY CAUSING ADOPTION OF A BURDENING PROTECTIVE POSTURE. IN CONTRAST TO EITHER OF THESE APPROACHES, THE OBJECTIVE OF PHASE I OF THIS STUDY IS TO ASSESS THE VULNERABILITY OF COMBAT VEHICLES TO ATTACK BY ANTIMATERIEL CHEMICAL AGENT. THE APPROACH INVOLVES (1) DEFINITION OF COMBAT VEHICLE KEY MISSION REQUIREMENTS AND IDENTIFICATION OF MATERIALS THAT ARE CRITICAL TO THE CAPABILITIES OF SYSTEMS AND SUBSYSTEMS INVOLVED IN THE ATTENDANT VEHICLE FUNCTIONS; (2) DEFINITION OF CHANGES IN PROPERTIES AND CHARACTERISTICS OF THESE MATERIALS (SUCH AS HARDNESS, SMOOTHNESS, OR ENERGY CONTENT) THAT WOULD DENY/LIMIT THE INTENDED PERFORMANCE OF THE ASSOCIATED VEHICLE FUNCTION.

GEOMET TECHNOLOGIES INC 20251 CENTURY BLVD GERMANTOWN, MD 20874 MARK STUNDER TITLE: AN ARTIFICIAL INTELLIGENCE/KNOWLEDGE BASED EXPERT SYSTEM FOR TACTICAL WEATHER EFFECTS T 74 OFFICE: LABCOM/ASL	ARMY	\$ 49,979
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A PHASE I PROGRAM IS PROPOSED TO METHODICALLY EXAMINE AND ORGANIZE



FISCAL YEAR 1986

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DEPT

AWARDED  
AMOUNT

BATTLEFIELD METEOROLOGICAL DATA AND INFORMATION IN SUPPORT OF ARMY MISSION AREAS. A KNOWLEDGE ENGINEERING PROCEDURE IS DISCUSSED THAT WILL FIRST IDENTIFY KEY AVAILABLE BATTLEFIELD METEOROLOGICAL RESOURCES AND SECONDLY DEVELOP AN EXPERT SYSTEM ARCHITECTURE. IMPLEMENTATION AND EVALUATION OF THE EXPERT SYSTEM WILL ALSO BE UNDERTAKEN. THE EXPERT SYSTEM WILL BE NECESSARILY LIMITED IN PHASE I TO ONE ARMY MISSION AREA. THE ADVANTAGES OF SUCH AN EFFORT WILL BE TO PROVIDE GUIDANCE FOR DOD METEOROLOGISTS IN THE PREPARATION OF TACTICAL WEATHER INTELLIGENCE. PHASE II EFFORTS WILL CENTER AROUND DEVELOPING OTHER MODULARIZED BATTLEFIELD METEOROLOGICAL EXPERT SYSTEMS AND PROVIDING A MENU-DRIVEN OVERALL PROCESSING SYSTEM.

GLOBAL INFORMATION SYS TECH

ARMY

\$ 50,000

201 W SPRINGFIELD

CHAMPAIGN, IL 61820

DR JOHN S SFONDILIAS

TITLE:

BUILDING A GENERIC INTELLIGENT TUTOR

T 112

OFFICE: MICOM

ICAI SYSTEMS CONTAIN CONTENT DOMAIN KNOWLEDGE AND TEACHING KNOWLEDGE. BOTH CONTENT DOMAIN AND TEACHING EXPERTS ARE NEEDED TO BUILD A COMPLETE ICAI SYSTEM. TWO SEPARATE KNOWLEDGE ACQUISITION PROCESSES MUST BE PERFORMED -- ONE FOR CONTENT, ONE FOR TEACHING STRATEGIES. IN THIS PROJECT, WE SYSTEMATICALLY CAPTURE AND REPRESENT THE TEACHING KNOWLEDGE IN AN INSTRUCTIONAL DIAGNOSTIC MODULE. THE TEACHING STRATEGIES REPRESENTED IN THIS MODULE ARE CONTENT-INDEPENDENT. THE CAPTURED TEACHING STRATEGIES ARE BASED ON A WELL-RESEARCHED EDUCATIONAL THEORY OF INSTRUCTION THAT HAS BEEN APPLIED IN NUMEROUS COMPUTER-BASED EDUCATION LESSIONS. BECAUSE CONTENT DOMAIN AND TEACHING KNOWLEDGE ARE SEPARATELY REPRESENTED, EITHER KNOWLEDGE BASE CAN BE UPDATED OR IMPROVED INDEPENDENTLY. THIS ALLOWS THE ICAI SYSTEM TO BE IMPROVED AS THE CONTENT DOMAIN CHANGES, OR TEACHING THEORY EVOLVES.

GORDON ASSOCS

NAVY

\$ 51,592

236 ANDOVER ST

WILMINGTON, MA 01887

STANLEY H GORDON

TITLE:

INVESTIGATION OF A NEW FIELD SYSTEM FOR DETACHING AND REMOUNTING SMDS

T 138

OFFICE: NSWC

A NEW SYSTEM FOR REPAIR OF HIGH-DENSITY, SURFACE-MOUNTED COMPONENTS

FISCAL YEAR 1986

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AND SOCKETS WILL BE INVESTIGATED. THIS SYSTEM WILL PROVIDE A NON-CONTACT MEANS OF HEATING SOLDER PADS AND TERMINALS, AND WILL INCLUDE COMPONENT REMOVAL AND REPLACEMENT FIXTURING METHODS. ENERGY MANAGEMENT OF FOCUSED INFRARED WILL PERMIT THE MELTING OF SOLDER AT DISCRETE SITES ANYWHERE ON A CIRCUIT BOARD WITHOUT HEATING THE COMPONENTS UNDER REPAIR.

GREEN MOUNTAIN RADIO RESEARCH CO 50 VERMONT AVE - FT ETHAN ALLEN WINOOSKI, VT 05404 FREDERICK H RAAB TITLE: POWER-AMPLIFIER SYSTEM FOR ADAPTIVE JAMMER T 55 OFFICE: CECOM/AMSEL	ARMY	\$ 57,558
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THE PROPOSED PROGRAM IS A FEASIBILITY STUDY AND SYSTEM DESIGN FOR AN INNOVATIVE POWER-AMPLIFIER SYSTEM FOR THE ADAPTIVE-JAMMER APPLICATION. THIS SYSTEM OPERATES OVER THE ENTIRE HF AND VHF RANGE (3 - 300 MHz), PRODUCES SIGNALS WITH VARIOUS TYPES OF MODULATION, AND CAN CONCENTRATE ALL OF ITS POWER ON A SINGLE TARGET OR DIVIDE ITS POWER AMONG SEVERAL TARGETS. ITS POWER AMPLIFIERS CAN BE OPERATED IN CLASS AB TO PRODUCE A CLEAN OUTPUT SIGNAL OR IN CLASS D TO PRODUCE GREATER POWER WITH GREATER EFFICIENCY WHEN HIGHER LEVELS OF HARMONICS, IMD, AND SPURIOUS PRODUCTS ARE ALLOWABLE. THE SYSTEM IS BASED UPON WIDE-BAND, MULTIMODE PA MODULES, HIGH-EFFICIENCY CLASS-S MODULATORS, HARMONIC CANCELLATION BY OUTPHASING, A BANK OF SWITCHED/TUNEABLE FILTERS, AND FEEDFORWARD ERROR CANCELLATION. CONTROL OF THE SYSTEM IS VESTED IN AN INTELLIGENT PROCESSOR.

GREENBRIAR SYSTEMS INC 8150 LEESBURG PIKE - STE 407 VIENNA, VA 22180 DIXON CLEVELAND TITLE: INFORMATION FEEDBACK CONTROL FOR DIRECTING STEERABLE ESM ANTENNAS T 31 OFFICE: SPAWAR	NAVY	\$ 49,631
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TO KEEP PACE WITH RAPIDLY GROWING NUMBERS OF EXOTIC EMITTERS, AND TO KEEP EQUIPMENT SIZE, WEIGHT AND COST DOWN AT THE SAME TIME, FURTHER ESM SYSTEMS MUST EMPLOY INTELLIGENT INFORMATION PROCESSING PROCEDURES

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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TO PERFORM THEIR JOBS OF GENERATING COMPLETE, ACCURATE, AND UP-TO-DATE "MAPS" OF THE ENEMY'S RADAR ENVIRONMENT. INTELLIGENT DATA COLLECTION PROCEDURES ARE REQUIRED TO ALLOW THE ESM SYSTEM TO FOCUS ON DATA THAT ARE MOST NEEDED TO IMPROVE THE SYSTEM'S PRESENT MAP OF THE ENEMY DISPOSITION. ANTENNA BEAM STEERING OFFERS ESM SYSTEMS A POWERFUL FOCUSING TOOL. THE PURPOSE OF THIS PROPOSED PROGRAM IS TO DEVELOP AN INTELLIGENT BEAM SCANNING STRATEGY, BASED UPON THE PRINCIPLE OF INFORMATION FEEDBACK CONTROL (IFC), WHICH EXPLOITS AN ESM SYSTEM'S FOCUSING CAPABILITIES TO ACHIEVE THE MAPPING GOAL.

GT-DEVICES INC	SDIO	\$ 95,043
5705A GENERAL WASHINGTON DR		
ALEXANDRIA, VA 22111		
RODNEY L BURTON		
TITLE:		
PERFORMANCE OF A HYDROGEN PULSED ELECTROTHERMAL THRUSTER		
T 6 OFFICE:		

FOR STRATEGIC DEFENSE ASSETS IN SPACE, AN ON-ORBIT PROPULSION CAPABILITY IS REQUIRED WHICH FEATURES HIGH EFFICIENCY AT A SPECIFIC IMPULSE OF 1000-3000 SECONDS. THIS PROPULSION IS REQUIRED FOR ORBIT TRANSFER, ORBITAL MANEUVERING AND STATION-KEEPING MISSIONS. THE PULSED ELECTROTHERMAL (PET) THRUSTER SEEMS PARTICULARLY ATTRACTIVE FOR THESE APPLICATIONS, AND HAS PREVIOUSLY APPROACHED THE PROPOSED PERFORMANCE LEVELS WITH WATER PROPELLANT IN THRUST STAND EXPERIMENTS. MUCH BETTER PERFORMANCE CAN BE ACHIEVED WITH LIQUID HYDROGEN, HOWEVER. PROPOSED IS THE DESIGN AND FABRICATIONS OF A HYDROGEN-FUELED THRUSTER FOR LABORATORY USE, WITH PARTICULAR ATTENTION FOCUSED ON THE PROBLEM OF MINIMIZING HYDROGEN BOILOFF DURING INJECTION. THE THRUSTER WILL BE TESTED IN VACUUM WITH GASEOUS HYDROGEN TO MEASURE THE BREAKDOWN VOLTAGE, AND USING THE TEST DATA, A CAPACITIVE PULSE FORMING NETWORK WILL BE DESIGNED. THESE TASKS ARE DESIGNED TO ESTABLISH THE TECHNICAL FEASIBILITY OF LIQUID HYDROGEN OPERATION IN A PULSED ELECTROTHERMAL THRUSTER.

GUILD ASSOCS INC	AF	\$ 53,658
7030 D HUNTLEY RD		
COLUMBUS, OH 43229		
DR RAM CHANDRASEKHAR		
TITLE:		
NOVEL AIR STRIPPING FOR VOC'S IN WATER		
T 300 OFFICE: AFESC/RDXP		

THE OBJECTIVE OF THE PROPOSED PROJECT IS TO IMPROVE THE EFFICIENCY OF

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>AIR STRIPPING PROCESSES THROUGH ENHANCED AIR/WATER CONTACTING. THE SUCCESS OF THE PROGRAM WILL ENSURE OPTIMUM USE OF CONTACTOR VOLUME AND MAXIMUM CONCENTRATION OF STRIPPED SOLUTE IN EXHAUST AIR. THE SUGGESTED NOVEL PROCESS COMBINES KNOWN TECHNOLOGIES. GROUND WATERS ARE FREQUENTLY INFILTRATED BY VOLATILE ORGANIC COMPOUNDS (VOC'S). MANY INDUSTRIAL PROCESSES PRODUCE VOC CONTAMINATED WASTEWATERS. AIR STRIPPING IS ACCEPTED AS BEING EFFECTIVE. PROCESSES TO-DATE ARE CONSIDERED LESS THAN ACCEPTABLE MAINLY DUE TO INEFFICIENT GAS/LIQUID CONTACTING. THE PROPOSED PROCESS COMBINES KNOWN TECHNOLOGIES TO SIGNIFICANTLY AUGMENT THE MASS TRANSFER INTERFACE. BESIDES OVER-COMING THE ABOVE MENTIONED DEFICIENCIES, THE PROCESS IS EXPECTED TO REDUCE ENERGY USE AND EASE DOWNSTREAM PROCESSING OF EXHAUST GASES. PHASE I WORK IS PLANNED TO SHOW TECHNICAL FEASIBILITY OF THE PROCESS IN A SMALL SCALE APPARATUS AND OBTAIN DATA FOR PILOT PLANT DESIGN AND DEMONSTRATE IN PHASE II.</p>		

GUMBS ASSOCS INC 11 HARTS LA EAST BRUNSWICK, NJ 08816 DR RONALD W GUMBS TITLE: TOUGH HIGH MODULUS EPOXY CASTING MATERIALS T 188	NAVY	\$ 49,830
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THE OVERALL OBJECTIVE OF THIS PROJECT IS TO DEMONSTRATE THE FEASIBILITY OF PREPARING LOW VISCOSITY, ROOM TEMPERATURE CURABLE, TOUGH, HIGH MODULUS EPOXY CASTING MATERIALS USING POLY(ARYL ETHER KETONES) AND POLY(ARYL ETHER SULFONE KETONE) COPOLYMERS AS IMPACT MODIFIERS. TOUGH, HIGH MODULUS CASTING MATERIALS ARE NOT AVAILABLE. AS THE MODULUS INCREASES, THE BRITTLINESS OF THE CONVENTIONAL PLASTICS ALSO INCREASES. BLENDING CERTAIN THERMOPLASTICS WITH EPOXY RESINS PRIOR TO NETWORK FORMATION IMPROVES THE FRACTURE TOUGHNESS WITH A RETENTION OF THE HIGH MODULUS. THE IMPROVEMENT IN TOUGHNESS RESULTS FROM DUCTILE YIELDING OF THE THERMOPLASTIC MODIFIER PARTICLES WHICH SEPARATE OUT DURING CURING. DURING PHASE I, THE EFFECT OF MOLECULAR WEIGHT AND CONCENTRATION OF THERMOPLASTIC MODIFIER ON THE VISCOSITY OF THE CASTING AND ON THE MECHANICAL PROPERTIES OF THE CURED EPOXY NETWORKS WILL BE DETERMINED. PHASE II WILL EMPHASIZE MORE DETAILED CHARACTERIZATION OF THE CASTING MATERIAL IN THE UNCURED STATE AND MORE COMPREHENSIVE TESTS OF THE CURED EPOXY NETWORKS. ACCELERATED AGING TESTS INCLUDING THERMAL AND HUMIDITY CYCLING WILL BE DEFERRED

FISCAL YEAR 1986

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UNTIL PHASE II.

GUYER SANTIN INC 917 - 7TH ST SACRAMENTO, CA 95814 JAMES NOLT TITLE: RAPIDLY DEPLOYABLE ELECTROMAGNETICALLY LOSSY BLANKET SYSTEM T 5 OFFICE: AM/SBIR	DNA	\$ 47,777
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A MILITARY SITUATION INVOLVING THE THREAT OF NUCLEAR WARFARE MAY REQUIRE RAPID DEPLOYMENT OF EQUIPMENT AND FACILITIES WHICH MAY REQUIRE SHIELDING AGAINST ELECTROMAGNETIC EFFECTS. THIS PROPOSAL IS TO EVALUATE THE FEASIBILITY OF A RAPIDLY DEPLOYABLE SHIELDING BLANKET SYSTEM THAT COULD BE QUICKLY ASSEMBLED IN THE FIELD FOR PROTECTION OF PERSONNEL AND EQUIPMENT. THE BLANKET WOULD CONSIST OF METAL COATED HIGH-STRENGTH PLASTIC OUTER SKINS BONDED TO A CONDUCTIVE LOSSY FILLER MATERIAL SUCH AS CONDUCTIVE FOAM OR MESH. BLANKETS WOULD BE TRANSPORTED ON STANDARDIZED ROLLS AND INDIVIDUAL BLANKETS WOULD BE ELECTRICALLY BONDED TOGETHER WITH CONDUCTIVE VELCRO-TYPE STRIPS. THEY WOULD BE ASSEMBLED OVER LIGHT WEIGHT STRUCTURAL FRAMES, OR COULD BE ASSEMBLED IN AN IMPROMPTU MANNER USING FIELD AVAILABLE MATERIALS.

HALSEY ENGINEERING & MANUFACTURING INC 209 MAYHILL RD DENTON, TX 76201 DONALD J HALSEY SR TITLE: A SYSTEMS APPROACH FOR AVIONIC PACKAGING AND RACKING FOR THE EC2 AIRCRAFT T 88 OFFICE: NAVAIR	NAVY	\$ 49,894
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HISTORICAL FAILURE DATA SHOW SOME SIXTY PERCENT OF INTEGRATED CIRCUIT FAILURES CAN BE TRACED TO INADEQUATE PROVISION FOR HEAT DISSIPATION. IMPROVING AVIONICS RELIABILITY REQUIRES FINDING REGIONS OF UNDUE THERMAL RESISTANCE IN THE COOLING AIR PATH FROM THE DEDICATED VAPOR CYCLE ENVIRONMENTAL CONTROL SYSTEM THROUGH SUPPLY DUCTING, RACK, SHELF, CAGE, CARD TO COMPONENT CASE. THE IMPERATIVE IS CONTROL OF THE COMPONENT CASE TEMPERATURE. SEVERAL OPTIONS CAN BE APPLIED TO

FISCAL YEAR 1986

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REDUCING ANY HIGH THERMAL RESISTANCE FOUND AND OPTIMAL APPROACHES WILL BE TRADED OFF FOR COST EFFECTIVE PERFORMANCE. ADDITIONALLY, FROM DATA ON THE FORCING SHOCK/VIBRATION SPECTRA, AT THE EQUIPMENT BAY, WE WILL SPECIFY ISOLATION PROVISIONS. OTHER CONSIDERATIONS TO BE TRADED-OFF VS. SELECTION CRITERIA INVOLVE WIRING, CONNECTORS, EMI PREVENTION AND SHIELDING AGAINST EMP. THE OBJECTIVE OF PHASE I IS TO ARRIVE AT A COMPREHENSIVE SET OF DESIGN REQUIREMENTS FOR A PROTOTYPE RACK SYSTEM PROVIDING A BENIGN ENVIRONMENT AND THEREBY DIRECTED TO IMPROVE RELIABILITY OF RACKED AVIONICS. THIS WILL BE DONE THROUGH SYSTEMS ENGINEERING AND TRADE-OFF METHODS OUTLINED HEREIN.

HARTMANN RESEARCH  
902 LOGANWOOD AVE  
RICHARDSON, TX 75080  
CLINTON S HARTMANN

ARMY

\$ 49,657

TITLE:

LOW-LOSS SAW FILTERS USING MONOLITHIC CONSTRUCTION - DEMONSTRATION  
T 83 OFFICE: LABCOM/ETDL

THE PROPOSED PROGRAM WILL PROVIDE EXPERIMENTAL VERIFICATION OF A NEW MONOLITHIC LOW-LOSS SAW TRANSDUCER STRUCTURE. THE STRUCTURE IS A SINGLE PHASE UNIDIRECTIONAL TRANSDUCER (SPUDT) BUT AVOIDS THE PROBLEMS ENCOUNTERED BY PREVIOUS SPUDT STRUCTURES. THE ADVANTAGES OF THE STRUCTURE INCLUDE EASE OF FABRICATION AND ADEQUATE REFLECTIVITY FOR BOTH WIDE BAND AND NARROW BAND FILTERS. THE STRUCTURE ALSO AVOIDS THE PROBLEMS ASSOCIATED WITH THE RECENTLY ANNOUNCED "NATURAL SPUDT" IN WHICH ALL TRANSDUCERS HAVE THEIR FORWARD ACOUSTIC PORTS POINTING IN THE SAME DIRECTION.

HATCH RESEARCH & DEVELOPMENT  
HC 85 - BOX 1329 ROCK CREEK DR  
CLINTON, MT 59825  
WILLIAM B HATCH

NAVY

\$ 50,000

TITLE:

NAVAL COUNTERMEASURES CONTROLLER  
T 36 OFFICE: SPAWAR

THE PROPOSED PROGRAM OFFERS AN INNOVATIVE APPROACH FOR PROTECTING A BATTLE GROUP FROM ATTACKS BY ADVANCED ANTI-SHIP MISSILES. SPACIALLY DISTRIBUTED COUNTERMEASURES, OF VARIOUS TYPES, ARE DEPLOYED IN A CO-

FISCAL YEAR 1986

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ORDINATED MANNER SO AS TO COUNTER ALL PHASES AND ASPECTS OF THREAT MISSILE WEAPON SYSTEMS. THESE COORDINATED COUNTERMEASURES TECHNIQUES ARE APPLIED SEQUENTIALLY AND THEIR EFFECTIVENESS AGAINST EACH ATTACKING MISSILE IS CONTINUOUSLY EVALUATED DURING THE ENGAGEMENT. IN THE EVENT THAT THE FINAL COUNTERMEASURE (ON-BOARD ECM) IS NOT SUCCESSFUL IN DEFEATING A MISSILE, AN ALERT IS PROVIDED IN TIME FOR HARD-KILL WEAPONS TO BE DEPLOYED. THIS ALERT IS MADE POSSIBLE BY A PROPRIETARY METHOD FOR PREDICTING, IN ADVANCED REAL-TIME, THE TERMINAL FLIGHT PATH OF AN ATTACKING MISSILE BING COUNTERED BY ECM. THE END PRODUCT OF THIS PROGRAM WILL BE A PRELIMINARY DESIGN FOR A SOFT-KILL DEFENSE NETWORK WHICH UTILIZES ADVANCED COORDINATED COUNTERMEASURES TECHNIQUES FROM SPACIALLY DISTRIBUTED PLATFORMS AND DEVICES THAT ARE UNDER THE DIRECTION OF A COUNTERMEASURES CONTROLLER. PRELIMINARY ANALYSIS, INCLUDED IN THIS PROPOSAL, INDICATES THAT THE SYSTEM WILL DEFEAT OVER 99% OF ALL ATTACKING ANTI-SHIP MISSILES.

HAWAII BIOTECHNOLOGY GP INC 99-193 AIEA HEIGHTS DR AIEA, HI 96701 MORTON MANDEL TITLE: DENGUE VACCINE DEVELOPMENT T 209 OFFICE: AMRDC/SGRD	ARMY	\$ 75,000
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THE ULTIMATE OBJECTIVE OF THIS PROJECT IS THE PRODUCTION OF A DENGUE VACCINE. THE FOUR DENGUE VIRUSES (SEROTYPES) AS A GROUP ARE BY FAR THE MOST IMPORTANT VIRUSES TRANSMITTED TO MAN BY ARTHROPODS AND IN TERMS OF GLOBAL MORBIDITY ARE RESPONSIBLE FOR SEVERAL HUNDRED THOUSAND TO SEVERAL MILLION CASES ANNUALLY. IN PHASE I RANDOM FRAGMENTS OF THE DENGUE VIRUS 2 (RNA) GENOME WILL BE CLONED INTO A BACTERIAL EXPRESSION VECTOR. THESE RANDOMLY GENERATED FRAGMENTS WILL BE PRODUCED IN TWO WAYS TO ENSURE COMPLETE COVERAGE OF THE RNA GENOME.

HAWAII BIOTECHNOLOGY GP INC 99-193 AIEA HEIGHTS DR AIEA HI 96701 NAVZER D SACHINVALA TITLE: TETRODOTOXIN IMMUNOASSAYS T 210 OFFICE: AMRDC/SGRD	ARMY	\$ 65,000
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TETRODOTOXIN IS A HIGHLY POTENT LOW MOLECULAR WEIGHT NEUROTOXIN

FISCAL YEAR 1986

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FOUND IN SOME SPECIES OF PUFFERFISH AND A FEW OTHER WIDELY DIVERGENT ORGANISMS. CURRENTLY, TETRODOTOXIN IS MEASURED BY MOUSE BIOASSAY OR WITH SOPHISTICATED CHROMATOGRAPHIC METHODS. A SIMPLE, SPECIFIC, EASY TO USE ASSAY METHOD FOR TETRODOTOXIN IS NEEDED. IMMUNOASSAYS ARE USED FOR DETERMINATION OF BIOLOGICALLY IMPORTANT SMALL MOLECULES IN A VARIETY OF CLINICAL AND NON-CLINICAL SITUATIONS. TO DATE, NO IMMUNOASSAYS FOR TETRODOTOXIN HAVE BEEN REPORTED, PRESUMABLY BECAUSE OF DIFFICULTIES ASSOCIATED WITH THE CHEMISTRY OF TETRODOTOXIN. WE PROPOSE TO SYNTHESIZE DERIVATIVES OF TETRODOTOXIN WHICH CAN BE USED AS HAPTENS FOR THE PRODUCTION OF ANTI-TETRODOTOXIN ANTIBODIES. PHASE I FOCUSES ON THE PROBLEM OF PRODUCING TETRODOTOXIN HAPTENS WHICH ARE SUITABLE FOR CONJUGATION TO THE TETRODOTOXIN MOLECULES. FOUR ROUTES LEADING TO TETRODOTOXIN HAPTENS ARE PROPOSED. WHEN SUITABLE TETRODOTOXIN HAPTENS HAVE BEEN SYNTHESIZED, POLYCLONAL AND MONOCLONAL ANTIBODIES WILL BE GENERATED AND USED TO DEVELOP NON-RADIOACTIVE IMMUNOASSAYS FOR TETRODOTOXIN.

HC CHEM RESEARCH &amp; SERVICE CORP

AF

\$ 58,436

3675 SKYVIEW DR

SAN JOSE, CA 95132

MING-TA HSU/TIMOTHY CHEN

TITLE:

TWO-PHASE ELASTOMER TOUGHENING OF BISMALEIMIDE RESINS

T 148

OFFICE: AFWAL/ML

A BETTER ELASTOMERIC MODIFIER WILL BE SEARCHED AND USED FOR BISMALEIMIDE (BMI) RESIN TO IMPROVE THE TOUGHNESS OF THE RESIN. THE GOAL IS GOOD ROOM TEMPERATURE TOUGHNESS WITH GOOD STRUCTURAL PERFORMANCE IN THE 350-450 DEG F RANGE. NEAT RESIN SPECIMENS AND LABORATORY SCALE GRAPHITE FIBER COMPOSITE SPECIMENS WILL BE MADE FOR TOUGHENING TESTS AND EVALUATIONS.

HELMAN ENGINEERING INC

AF

\$ 47,874

2908 S 25TH ST

LINCOLN, NE 68502

MARVIN L HELMAN

TITLE:

DEVELOPMENT STUDY TO DESIGN A COMPUTER-CONTROLLED TENSIONING SYSTEM FOR USE IN MANUFACTURING FILAMENT WOUND STRUCTURES

T 161

OFFICE: AFWAL/ML

A VERY CRITICAL ELEMENT IN THE MANUFACTURE OF FILAMENT WOUND COM-



FISCAL YEAR 1986

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POSITIVE STRUCTURES (FWCS) IS THE PRECISE TENSION CONTROL OF THE ROVING FILAMENT (AT THE POINT IT CONTACTS THE PART). PRESENTLY, THERE ARE NO OFF-THE-SHELF TENSIONERS ABLE TO MAINTAIN ACCURATE, DYNAMIC TENSION AT THE ROVING SPOOL. CONSEQUENTLY, BOTH THE MANUFACTURE AND THE R & D OF FWCS TECHNOLOGY IS SEVERELY HANDICAPPED. THE IDEAL TENSIONER MUST COMPENSATE FOR ITS OWN FRICTION AND INERTIA, AND OTHER DYNAMIC FACTORS WHICH OCCUR BETWEEN THE TENSIONER AND THE PART. HELMAN ENGINEERING HAS BUILT AN ADVANCED TENSIONER WHICH HAS SOLVED ONE OF THE TECHNICAL PROBLEMS STATED, AND HAS SHOWN THAT A NEW APPROACH IS NOT ONLY COST EFFICIENT AND FEASIBLE BUT ALSO ESSENTIAL TO THE ADVANCEMENT OF COMPOSITE STRUCTURE TECHNOLOGY. THE EFFORT PROPOSED IS TO PERFORM ADVANCED RESEARCH TO GATHER THE NECESSARY INFORMATION IN ORDER TO DESIGN A NEW REVOLUTIONARY, COMPUTER-CONTROLLED TENSIONING SYSTEM WHICH WILL DELIVER ACCURATE, PROGRAMMABLE TENSION TO THE PART (COMPENSATING/CORRECTING FOR ALL FACTORS WHICH PRODUCE ERRORS THROUGHOUT THE DELIVERY SYSTEM), COMMUNICATE WITH THE WINDER COMPUTER DURING OPERATIONS AND RECORD THE TRUE, DYNAMIC TENSION HISTORY DATA OF THE FILAMENT WOUND STRUCTURE.

HERSH ACOUSTICAL ENGINEERING INC  
9545 COZYCROFT AVE  
CHATSWORTH, CA 91311  
ALAN S HERSH

AF

\$ 49,129

## TITLE:

DYNAMIC CONTROL OF INSTABILITIES WITHIN LIQUID ROCKET ENGINES -  
FEASIBILITY STUDY

T 76

OFFICE: AFRPL/TSTR

A RESEARCH PROGRAM IS PROPOSED TO ASSESS THE FEASIBILITY OF DESIGNING AN ADAPTIVE FEEDBACK CONTROL SYSTEM TO DYNAMICALLY TUNE ACOUSTIC CAVITIES FOR MAXIMUM DAMPING OF UNSTABLE PRESSURES WITHIN LIQUID ROCKET ENGINES OVER ITS OPERATIONAL RANGE FROM IGNITION TO SHUTOFF. THE RESEARCH EFFORT IS DIVIDED INTO FOUR PARTS. FIRST, A THOROUGH LITERATURE REVIEW WILL BE CONDUCTED TO DETERMINE THE STATE-OF-THE-ART IN THE DESIGN OF ACOUSTIC CAVITIES. SECOND, THE RANGE OF CAVITY IMPEDANCES REQUIRED TO ACHIEVE MAXIMUM DAMPING OF ALL EXCITED MODES WITHIN A TYPICAL ENGINE WILL BE DETERMINED. THIRD, CANDIDATE ADAPTIVE FEEDBACK CONTROL SYSTEMS WILL BE PROPOSED AND FOURTH, THEIR FEASIBILITY ASSESSED IN TERMS OF THEIR ABILITY TO SURVIVE IN THE HOSTILE ENVIRONMENT WITHIN LIQUID ROCKET ENGINES.

FISCAL YEAR 1986

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HIGH TECHNOLOGY SERVICES INC 250 JORDAN RD TROY, NY 12180 MILTON L EVANS TITLE: TOUGHENING OF UNIQUE MODIFIED LARC-13 POLYIMIDE BLENDS BY COMPOSITIONAL QUENCHING T 148 OFFICE: AFWAL/ML	AF	\$ 50,000

RESEARCH WILL BE CONDUCTED ON THE FEASIBILITY OF RADICALLY IMPROVING THE PHYSICAL PROPERTY PROFILE OF SELECTED POLYMER MATRIX COMPOSITES BY MEANS OF A NEW AND HIGHLY INNOVATIVE TECHNIQUE CALLED "COMPOSITIONAL QUENCHING". THIS TECHNIQUE ALLOWS CREATION OF MICRODISPERSIONS OF ONE POLYMER IN ANOTHER WHICH MAY LEAD TO IMPROVEMENT IN IMPACT RESISTANCE, FRACTURE TOUGHNESS, INTERLAMINAR AND TRANSVERSE SHEAR STRENGTH. EMPHASIS WILL BE PLACED ON UNIQUE COMPOSITIONS BASED ON LARC TECHNOLOGY OF POLYIMIDES BLENDED WITH OTHER HIGH PERFORMANCE MATERIALS FOR STRUCTURAL APPLICATIONS. SPECIAL ATTENTION WILL BE GIVEN TO ACHIEVING UNIFORM POLYMER DISPERSIONS WITHIN TOUGH POLYIMIDE MATRICES. THESE COMPOSITIONS WILL THEN BE EVALUATED TO DETERMINE THE EFFECT ON COMPOSITE PROPERTIES. INITIAL WORK WILL INVOLVE (1) IDENTIFICATION OF PROMISING COMPOSITIONS (2) SCREENING OF CANDIDATE RESINS AND COMPOSITES AND (3) EVALUATING PROPERTIES OF SELECTED CANDIDATES AS COMPOSITES FOR FURTHER DEVELOPMENT IN PHASE II.

HITTITE MICROWAVE CORP 21 CABOT RD WOBURN, MA 01801 YALCIN AYASLI TITLE: HIGH POWER RF SWITCH T 164 OFFICE: NAVAIR/PMTC	NAVY	\$ 67,058
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PRESENTLY HIGH-POWER RADIO-FREQUENCY SWITCH DEVICES ARE CONSTRUCTED USING PACKAGED PIN DIODES. DUE TO THE HIGH THERMAL RESISTIVITY OF THESE DIODES, SWITCHING AT HIGH CW POWER LEVELS IS DIFFICULT. FURTHERMORE THE DRIVER CIRCUIT REQUIREMENTS FOR THE CONTROL OF THESE DEVICES ARE HIGH, RESULTING IN REDUCED SWITCHING SPEED AND BANDWIDTH, AS WELL AS INCREASED VOLUME, WEIGHT, AND COST. IN THIS PROPOSAL AN ALTERNATIVE APPROACH, BASED ON GALLIUM ARSENIDE MONOLITHIC FET TECHNOLOGY, IS PRESENTED. THESE DEVICES ARE EXAMINED IN TERMS OF THEIR

FISCAL YEAR 1986

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POWER HANDLING CAPABILITIES TO MEET THE DESIRED REQUIREMENTS. THIS PROPOSAL CONTAINS THE BACKGROUND INFORMATION AND DETAILED DESCRIPTION OF THE TECHNICAL APPROACH FOR THE DESIGN OF SUCH GaAs FET-BASED SWITCHES. IT IS SHOWN THAT THESE COMPONENTS CAN MEET OR EXCEED ALL THE PERFORMANCE GOALS FOR VOLUME, WEIGHT, SPEED, INTEGRATION CAPABILITY, BANDWIDTH, AND SIMPLIFIED DRIVER REQUIREMENTS.

HODGE COMPUTER RESEARCH CORP 1588 BATAUIA ORANGE, CA 92667 WINSTON HODGE TITLE: HIGH LEVEL LANGUAGE ENGINE/CONTROLLER T 120 OFFICE: NSWC	NAVY	\$ 49,869
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A HIGH LEVEL LANGUAGE CONTROLLER DESIGN WOULD BE EXPLORED TO PROVIDE AN ADAPTIVE UNIVERSAL CONTROLLER THAT COULD BE USED TO SATISFY A WIDE NUMBER OF PURPOSES. THE MACHINE WOULD BE CONTROLLED BY TWO LEVELS OF SOFTWARE WITH THE FIRST LEVEL BEING MICROCODE THAT DEFINES MACHINE FUNCTION AND THE SECOND LEVEL BEING APPLICATION SOFTWARE TO CARRY OUT SPECIFIC TASKS ASSIGNED TO THE CONTROLLER.

HOKENSON CO 840 S TREMAINE AVE LOS ANGELES, CA 90005 DR GUSTAVE J HOKENSON TITLE: MULTI-DIMENSIONAL EFFECTS IN TRANSIENT MHD-SYSTEMS: THEIR COMPUTATION LOSS MODELING AND SUPPRESSION T 106 OFFICE: NSWC	NAVY	\$ 49,688
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A COMPREHENSIVE COMPUTATIONAL STUDY OF MULTI-DIMENSIONAL (GAS/CURRENT) FLOW EFFECTS IN INHERENTLY TRANSIENT MHD SYSTEMS IS PROPOSED. TWO CLASSES OF FLOWFIELD NON-UNIFORMITY SHALL BE ADDRESSED: 1) ONE CLASS WITH INHERENT STREAMWISE VORTICITY, AND 2) ANOTHER CLASS WITH STREAMWISE VORTICITY ARISING FROM THE E-M INTERACTIONS. BOTH THREE-DIMENSIONAL AND TWO DIMENSIONAL TRANSIENT FLOWS SHALL BE STUDIED, WITH THE TWO-DIMENSIONAL INCLUDING BOTH INFINITE SPAN-WISE EXTENT AND SPAN-WISE AVERAGED INCLUDING 3-D EFFECTS. THE TEMPORAL RESOLUTION SHALL INCLUDE: 1) FULL NUMERICAL SIMULATION OF TURBULENT AND CO

FISCAL YEAR 1986

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HERENT FLUCTUATIONS AT LOW RE, 2) LARGE-EDDY SIMULATION OF THE TURBULENCE (WITH APPROPRIATE SGS PROCESS MODELING) AND FULL RESOLUTION OF COHERENT FLUCTUATIONS, AND 3) MODELED TURBULENCE WITH FULL RESOLUTION OF COHERENT FLUCTUATIONS. IN ADDITION, TEMPORALLY-PERIODIC REPETITIVE OPERATION SHALL BE COMPARED TO A SINGLE BURST IN ORDER TO EXPOSE THE 'MEMORY' EFFECT OF FLOWFIELD COMPONENTS WITH LONGER TIME SCALES. FINALLY, THE EFFECT OF SPATIALLY-PERIODIC ELECTRODE/INSULATOR GEOMETRY SHALL BE COMPARED TO A LOCALLY SPATIALLY-AVERAGED APPROACH WHICH IS THE FORMALLY CORRECT EQUIVALENT TO THE AD HOC INFINITE SEGMENTATION MODEL. THE COMPUTER DATA SHALL BE RETAINED FOR USE BY THE GOVERNMENT AND ITS CONTRACTORS. THE DATA SHALL ALSO BE PRESENTED IN COLOR '3-D' PLOTS AND VIDEO-TAPES FOR USE IN INTERPRETING EXPERIMENTAL DATA, QUANTIFYING 'LOSS' MODELS FOR SIMPLIFIED CODES, AND SUPPRESSING 3-D EFFECTS VIA SPECIFIC SYSTEM DESIGN MODIFICATIONS.

HOKENSON CO	AF	\$ 43,717
840 S TREMAINE AVE		
LOS ANGELES, CA 90005		
DR GUSTAVE J HOKENSON		

## TITLE:

MINIMUM DRAG BODY DESIGN UTILIZING STATE-OF-THE-ART TURBULENCE MODELS AND (OPTIONAL) LAMINAR FLOW CONTROL FOREBODIES

T 27 OFFICE: AFATL/FXA

UTILIZING AN EXISTING NUMERICAL MODEL OF COUPLED VISCOUS-INVISCID FLOW AROUND AXISYMMETRIC BODIES, THE DESIGN OF MINIMUM DRAG BODIES FOR ARBITRARY MACH AND REYNOLDS NUMBERS SHALL BE SOUGHT. STATE-OF-THE-ART TURBULENT BOUNDARY LAYER MODELS AND THE OPTION OF SPECIFYING A LAMINAR FLOW CONTROLLED FOREBODY SHALL BE INCORPORATED. DUE TO THE COMPLEXITY OF THE VISCOUS-INVISCID FLOW INTERACTION MODEL, AN ITERATIVE DIRECT METHOD OF SEEKING THE MINIMUM DRAG CONFIGURATIONS SHALL BE EMPLOYED. IN THIS APPROACH VARIOUS GEOMETRICAL CONSTRAINTS ARE FIRST IMPOSED ON THE DESIGN. SUBSEQUENTLY, A DISCRETE NUMBER OF PARAMETERS WHICH CHARACTERIZE THE CONFIGURATION ARE PERTURBED WITH THE ERRORS (IN THE CONSTRAINTS) AND THE DRAG COEFFICIENT SENSITIVITY TO THESE CONFIGURATION PERTURBATIONS COMPUTED. UTILIZING THE SENSITIVITY MATRIX, THE CONFIGURATION IS MODIFIED UNTIL THE ERRORS ARE ZERO AND THE DRAG COEFFICIENT IS STATIONARY. MAINTENANCE OF MINIMUM DRAG AT OFF-DESIGN CONDITIONS SHALL BE ADDRESSED BY USE OF A (NO FLUID STORAGE) SUCTION/BLOWING BOUNDARY LAYER MASS TRANSFER SYSTEM.

FISCAL YEAR 1986

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DURING PHASE I, THE PHASE II WORK PLAN SHALL BE FORMULATED INCLUDING EXPERIMENTAL VALIDATION TESTS AND APPLICATION OF THE APPROACH TO THREE-DIMENSIONAL BODIES.

HOKENSON CO  
840 S TREMAINE AVE  
LOS ANGELES, CA 90005  
DR GUSTAVE J HOKENSON

AF

\$ 43,717

## TITLE:

PROJECTILE DRAG MINIMIZATION UTILIZING BASE BLEED FLOW FROM A  
SLOW-BURNING SOLID PROPELLANT WAFER ADD-ON

T 35 OFFICE: AFATL/MNG

UTILIZING AN EXISTING NUMERICAL MODEL OF SWIRLING AND RECIRCULATING BASE FLOW, SIMULATIONS OF PROJECTILE BASE DRAG REDUCTION DUE TO BASE BLEED FLOW SHALL BE CARRIED OUT. MODIFICATIONS TO THE EXISTING CODE SHALL INCLUDE THE EXPLICIT DEPENDENCE OF TURBULENCE ON SWIRL AND NON-AXISYMMETRIC EFFECTS IN THE AZIMUTHALLY-AVERAGED GOVERNING EQUATIONS. WITH THIS, THE EFFECT OF A HOT GAS INJECTION AT RELATIVELY LOW FLOW RATES, DUE TO A SLOW-BURNING SOLID PROPELLANT WAFER AFFIXED TO THE PROJECTILE BASE, SHALL BE ASSESSED. A TYPICAL CONFIGURATION, MACH NUMBER AND REYNOLDS NUMBER SHALL BE SELECTED FOR PHASE I STUDIES WITH VARIOUS FLOW RATES INJECTION TEMPERATURES, AND PROJECTILE SPIN RATES. DURING THIS FEASIBILITY STUDY, THE SIZE AND WEIGHT PERTURBATIONS DUE TO THE WAFER SHALL BE IGNORED. HOWEVER, DURING PHASE I, THE PHASE II WORK PLAN SHALL BE WRITTEN AND INCLUDE A SYSTEM ANALYSIS WHICH OPTIMIZE THE WAFER SIZE/WEIGHT AND DRAG REDUCTION/TIME-OF-ACTION TRADE-OFFS. ALSO, DURING PHASE II, THREE-DIMENSIONAL PHENOMENA INDUCED BY THE MAGNUS EFFECT SHALL BE ADDRESSED. FINALLY, GIVEN THE FEASIBILITY WHICH PHASE I SEEKS TO DEMONSTRATE RELATIVE TO LOW FLOW RATES (SMALL, SLOW-BURNING WAFERS) AND HIGH INJECTION TEMPERATURES, AN EXHAUSTIVE SET OF PHASE II COMPUTATIONS SHALL BE PLANNED AND COVER THE ENTIRE RANGE OF MACH AND REYNOLDS NUMBERS OF INTEREST.

HOKENSON CO  
840 S TREMAINE AVE  
LOS ANGELES, CA 90005  
DR GUSTAVE J HOKENSON

AF

\$ 46,688

## TITLE:

SOME RAMJET COMBUSTION INSTABILITY ACTIVE CONTROL STRATEGIES

T 3 OFFICE: AFOSR/XOT

UTILIZING AN EXISTING TIME-DEPENDENT MULTI-DIMENSIONAL FLOW CODE,

FISCAL YEAR 1986

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THE CAPABILITY TO SUPPRESS RAMJET COMBUSTION INSTABILITIES WITH VARIOUS ACTIVE CONTROLS SHALL BE EVALUATED. A GENERIC TWO-SHOCK ON-DESIGN INLET, SWIRLING DUMP COMBUSTOR AND COVERGING-DIVERGING NOZZLE SHALL BE POSTULATED WITH LARGE-SCALE TURBULENT FLUCTUATIONS IN THE COMBUSTOR AS THE INITIAL 'NOISE' SOURCE. DUE TO THE INTERACTION WITH UPSTREAM AND DOWNSTREAM 'BOUNDARIES', THE PROPAGATION ACOUSTIC AND ADVECTING VORTICITY AND ENTROPY WAVES ARE PARTIALLY REFLECTED AND, FOR SOME CONDITIONS, RE-INFORCE THE COMBUSTOR DISTURBANCE. THREE CANDIDATE CONTROL MECHANISMS ARE PROPOSED FOR EVALUATION: 1) (VARIABLE GEOMETRY) AREA DISTRIBUTION, 2) VARIABLE SWIRL AND 3) VARIABLE HEAT RELEASE DISTRIBUTION, WHICH ARE MOTIVATED BY THE DESIGN TO MODIFY THE ACOUSTIC (1), VORTICITY (2) AND ENTROPY (3) WAVE DYNAMICS. DURING PHASES I & II, ALL CONTROL STRATEGIES WILL BE EVALUATED RELATIVE TO ALL MODES OF INSTABILITY. HOWEVER, OSCILLATION IN ORDER TO DEMONSTRATE THE CONCEPT FEASIBILITY. BOTH RE-DISTRIBUTED STEADY HEAT RELEASE AND HEAT RELEASE WITH A PULSATILE COMPONENT (WHOSE AMPLITUDE, FREQUENCY AND PHASE SHALL BE OPTIMIZED RELATIVE TO THE INSTABILITY) SHALL BE ASSESSED. IN ADDITION, THE INTERACTION OF THIS STABILITY AND CONTROL STRATEGY WITH SYSTEM TRANSIENTS ASSOCIATED WITH START-UP, SHUT-DOWN AND CHANGE IN OPERATING POINT SHALL BE SIMULATED. ALL RESULTS SHALL BE PRESENTED WITH STATE-OF-THE-ART COLOR GRAPHICS PLOTS AND VIDEO-TAPE DISPLAYS.

HOKENSON COMPANY, THE  
840 S. TREMAINE AVE.  
LOS ANGELES, CA 90005  
GUSTAVE J. HOKENSON, PHD

SDIO

\$ 46,688

TITLE:

OPTIMAL AERODYNAMIC SHAPES FOR HYPERVELOCITY PROJECTILES

T 2 OFFICE:

UTILIZING EXISTING VISCOUS AND INVISCID FLOW TOOLS DEVELOPED BY THE PRINCIPAL INVESTIGATOR, THE MINIMUM DRAG HYPERVELOCITY PROJECTILE SHAPE FOR A GIVEN SET OF GEOMETRIC CONSTRAINTS SHALL BE DETERMINED AS A FUNCTION OF MACH AND REYNOLDS NUMBERS. BY UTILIZING AN AMALGAMATION OF: 1) HYPERSONIC SMALL DISTURBANCE THEORY, 2) HYPERSONIC BOUNDARY LAYER THEORY AND 3) EXTENDED TANGENT CONE VISCOUS INTERACTION MODELING, THE OPTIMUM SLENDER SHAPES OF SPIN- AND FIN-STABILIZED CIRCULAR CROSS SECTION AND FIN-STABILIZED RECTANGULAR CROSS-SECTION PROJECTILES SHALL BE DETERMINED BY AN ITERATIVE DIRECT APPROACH. IN ADDITION, DURING PHASE I, THE OFF-DESIGN PERFORMANCE

FISCAL YEAR 1986

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OF EACH CONFIGURATION SHALL BE CHARACTERIZED BY EVALUATING ITS AVERAGE C(D) OVER A RANGE OF MACH AND REYNOLDS NUMBER ON EITHER SIDE OF THE POINT. FINALLY, DURING PHASE I, THE PHASE II WORK PLAN SHALL BE DRAWN UP INCLUDING EXTENSIVE DESIGN COMPUTATIONS, EXPERIMENTAL VALIDATION STUDIES, AND THE IMPLEMENTATION OF A DESIGN PROCEDURE WHICH PROVIDES EITHER THE MINIMUM AVERAGE C(D) OVER THE RANGE OF MACH AND REYNOLDS NUMBERS ENCOUNTERED IN GENERIC MISSIONS OR THE MINIMUM ENERGY DISSIPATION IN A SPECIFIED TRAJECTORY.

HOKENSON COMPANY, THE	SDIO	\$ 46,688
840 S. TREMAINE AVE.		
LOS ANGELES, CA 90005		
GUSTAVE J. HOKENSON, PHD		
TITLE:		
OPTIMAL PULSED THRUSTERS FOR AERODYNAMIC CONTROL OF HYPERVELOCITY		
SMART PROJECTILES: THE ASYMMETRIC EFFECTIVE BODY CONCEPT		
T 2 OFFICE:		

UTILIZING EXISTING NUMERICAL CODES AND VECTORED MASS TRANSFER CONCEPTS DEVELOPED BY THE PRINCIPAL INVESTIGATOR, THE UTILITY OF LOW MOMENTUM PULSED THRUSTERS AS AERODYNAMIC CONTROL DEVICES ON HYPERVELOCITY SMART PROJECTILES SHALL BE QUANTIFIED. A LOW INJECTED FLOW RATES AND MOMENTA, THE SIDE-FORCE GENERATED BY THE DISTORTED AERODYNAMIC PRESSURE FIELD MAY BE MANY TIMES LARGER THAN ITS DIRECT THRUST. AT THE OPTIMUM VECTOR ANGLE, THE EFFECTIVENESS OF SIDE-FORCE GENERATION MAY BE SUFFICIENT TO ALLOW THIS CONCEPT TO SERVE ALL OF THE MANEUVERING REQUIREMENTS, AS WELL AS TRIMMING FUNCTIONS. NOTE THAT, WITH THE ASYMMETRIC 'EFFECTIVE AERODYNAMIC BODY' VIEW OF THE PROCESS, NORMAL INJECTION IS NOT OBVIOUSLY OPTIMAL AND THE FULL RANGE OF VECTORING (RELATIVE TO THE SURFACE NORMAL) FOR VARIOUS PITCH/YAW AND ROLL CONTROL MUST BE ASSESSED. FOR VARIOUS MACH NUMBERS, BOUNDARY LAYER CHARACTERISTICS AND THRUSTER FLOWS (MOMENTA AND ANGLES), THE COUPLED THRUSTER INJECTION FLOW FIELD AND INDUCED PRESSURE FIELD SHALL BE COMPUTED IN BOTH WEAK AND STRONG INTERACTION. TIME-DEPENDENT FORCES/MOMENTS AND INTEGRATED IMPULSES, AND CENTERS OF PRESSURE SHALL BE OBTAINED. FOR WEAK INTERACTION, THE TANGENT WEDGE/CONE THEORIES AND THREE-DIMENSIONAL EXTENSIONS THEREOF SHALL BE USED. FOR STRONG INTERACTION, DIRECT NUMERICAL SIMULATIONS ARE PLANNED. FINALLY, DURING PHASE I, THE PHASE II WORK PLAN SHALL BE DRAWN UP, INCLUDING A COMPREHENSIVE MATRIX OF NUMERICAL SIMULATIONS AND CORROBORATIVE WIND TUNNEL TESTS.

FISCAL YEAR 1986

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HOLLINGSEAD INTERNATIONAL INC 13701 EXCELSIOR DR SANTE FE SPRINGS, CA 90670 CAESAR ESPINOSA	NAVY	\$ 49,991
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TITLE:  
SPECIFYING STATE-OF-THE-ART BETWEEN AIRCRAFT AND TODAY'S SOPHISTI-  
CATED MILITARY AVIONICS INCREASES MISSION CAPABILITY UP TO 4:1  
T 88 OFFICE: NAVAIR

STATE-OF-THE-ART INTERFACING BETWEEN THE AIRCRAFT AND AVIONICS WILL BE PROVEN THROUGH RESEARCH OF THE FOLLOWING TARGET AREAS: IMPROVED SHOCK AND VIBRATION CONTROL BY INCORPORATING THE BOX-MOUNT FLOATING BEAM ISOLATION SYSTEM. THE FLOATING BEAM IS A MULTI-DIRECTIONAL ISOLATION SYSTEM OFFERING ENHANCED PROTECTION IN ALL ATTITUDES OF FLIGHT. DISTRIBUTING FREQUENCIES TO THE RACK ARE REDUCED OR ELIMINATED. SEPARATE TRAY SYSTEMS THAT IMPROVE CONNECTOR MATEABILITY, INCREASE AIRFLOW EFFICIENCY, CREATE GREATER TRAY STRENGTH AND IMPROVE MAINTAINABILITY. LIGHTER WEIGHT, SPACE SAVING, FORCE LIMITING INSERTION/EXTRACTION HOLD-DOWNS FOR USE WITH TODAY'S AND TOMORROW'S AVIONICS. DEVELOPMENT OF DEVICES TO EFFECTIVELY DISCHARGE ELECTROMAGNETIC FIELDS, ESPECIALLY UHF AND VHF FROM AVIONIC BOXES TO THE RACKING AND AIRFRAME. WEIGHT REDUCTION OF ALL RACKING COMPONENTS WILL BE PROVIDED WITH AN INCREASE IN PAYLOAD CAPABILITIES.

HOODWILL INSTRUMENTS RTE 1 - BOX 246 SAWYER, MI 49125 LOUIS S HOODWILL	ARMY	\$ 4,412
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TITLE:

ENGINE TORQUE CORRELATED WITH ANGULAR ACCELERATIONS  
T 119 OFFICE: TACOM/AMSTA

FOR ENGINE TESTING, AN ANGULAR ACCELERATION SENSING SYSTEM WILL BE ADAPTED TO BE DRIVEN BY THE CRANKSHAFT WITHOUT IMPACT ON THE DRIVELINE LAYOUT. A CORRELATION WILL BE ESTABLISHED BETWEEN CRANKSHAFT ANGULAR ACCELERATIONS AND OVERALL ENGINE TORQUE OUTPUT. THE SENSING SYSTEM WILL BE UTILIZED TO MEASURE THE TORQUE CONTRIBUTED BY EACH INDIVIDUAL CYLINDER IN A MULTI-CYLINDER ENGINE. THIS SYSTEM MAY ALSO BE USED TO MAKE ENGINE SPEED VS. TORQUE MEASUREMENTS WITHOUT A



FISCAL YEAR 1986

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DYNAMOMETER BY UTILIZING THE INERTIAL LOAD OF THE ENGINE.

HORINE ENGINEERS INC PO BOX 2027 LOS GATOS, CA 95031 CARLTON L HORINE TITLE: ASSESSMENT OF HAZARDOUS OPERATIONS T 32 OFFICE: ARDC/SMCAR	ARMY	\$ 48,866
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IT IS PROPOSED TO SURVEY AVAILABLE INFORMATION ON THE NUMBER OF OPERATORS AND THE DEGREE TO WHICH THEY ARE EXPOSED AT ARMY MUNITIONS PLANTS. THIS INFORMATION WILL BE SCREENED AND ASSESSED TO DETERMINE THOSE LINES AND BUILDINGS THAT ARE THE BEST CANDIDATE FOR A STUDY TO ELIMINATE PERSONNEL FROM HAZARDOUS OPERATIONS BY PROCESS AND METHODS MODIFICATIONS. AN ON-SITE AUDIT WILL BE MADE TO OBTAIN DATA FOR METHODS ANALYSES. A VIDEO/SOUND CAMERA WILL BE USED WHEREVER POSSIBLE. THIS WILL INCLUDE THE NUMBER OF OPERATORS, DESCRIPTION OF OPERATING STEPS AND DESCRIPTION HAZARDS. THE DATA FOR THE AUDIT WILL BE ASSESSED AND PROCESS MODIFICATIONS RECOMMENDED THAT WILL RESULT IN REMOVAL OF OPERATORS FROM THESE HAZARDOUS OPERATIONS.

HORIZONS TECHNOLOGY INC 7830 CLAIREMONT MESA BLVD SAN DIEGO, CA 92111 PATRICK E WALKER TITLE: ADVANCED TRAINING TECHNOLOGY APPLICATIONS FOR EXPLOSIVE ORDNANCE DISPOSAL (EOD) PROCEDURES T 165 OFFICE: NAVSEA/NTEC	NAVY	\$ 68,094
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IN THIS DOCUMENT, HORIZONS TECHNOLOGY, INC. (HTI) PROPOSES TO EXAMINE THE APPLICATION OF SMALL COMPUTERS AND ADVANCED TRAINING TECHNOLOGY TO PROBLEMS OF HIGH ATTRITION AND ROLLBACK IN EXPLOSIVE ORDNANCE DISPOSAL (EOD) TRAINING AT THE NAVAL EOD SCHOOL. THE COMPUTER-ASSISTED-INSTRUCTION (CAI) RELATED ASPECTS OF EOD TASKS WILL BE IDENTIFIED AND ANALYZED THOROUGHLY. SEVERAL POSSIBLE HARDWARE AND SOFTWARE SYSTEMS FOR USE IN TRAINING AND OPERATIONS WILL BE COMPARED FOR POTENTIAL EFFECTIVENESS IN SOLVING THE INSTRUCTIONAL PROBLEM. HTI HAS SPECIAL EXPERIENCE IN PROVIDING HANDHELD COMPUTERIZED TRAINING AND OPERA-

FISCAL YEAR 1986

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AMOUNT  
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TIONAL JOB AIDS TO THE MILITARY SERVICES. PHASE I WILL CULMINATE IN A SUGGESTED PROTOTYPE CAI SYSTEM TO BE DEVELOPED AND EVALUATED IN PHASE II. SPECIAL ATTENTION WILL BE PAID TO PROMISING NEW TECHNOLOGIES SUCH AS INTERACTIVE AUDIO, VIDEO, DIGITAL GRAPHICS, CD/ROM, AND OTHER OPTICAL MASS-STORAGE DEVICES. THE CAI SYSTEM PROPOSED WILL STORE ALL EOD REFERENCE DATA IN VERY COMPACT FORM, WILL PROVIDE STREAMLINED AND USER-FRIENDLY ACCESS, AND WILL BE APPLIED TO THE TASKS OF ORDNANCE IDENTIFICATION, SAFETY PRECAUTION SPECIFICATION, TOOL SELECTION, AND TO THE RENDERING SAFE PROCEDURE (RSP). FOLLOWING TRAINING, THE SAME SYSTEM WILL BE USABLE AS AN ELECTRONIC JOB AID IN THE FIELD ENVIRONMENT.

HTC INDUSTRIES, INC.

SDIO

\$ 52,812

11 CANAAN WAY

SIMSBURY, CT 06070

HAROLD T. COUCH, PHD

TITLE:

SPACE THERMAL ENERGY STORAGE

T 4 OFFICE:

A PHASE I ANALYTICAL EFFORT TO IDENTIFY AND RANK CANDIDATE FUSED SALT SYSTEMS FOR HIGH TEMPERATURE THERMAL ENERGY STORAGE AND TO MODEL THE THERMAL ENERGY RELEASE PROCESS IS PROPOSED. THE WORK IS BROKEN INTO THREE TASKS, INVOLVING: (a) THE IDENTIFICATION OF SUITABLE LOW MOLECULAR WEIGHT FUSED SALTS OR FUSED SALT EUTECTICS HAVING A FUSION TEMPERATURE OF APPROXIMATELY 800 C AND A LATENT HEAT OF FUSION OF 200 CAL/GRAM, (b) THE ANALYTIC MODELING OF THERMAL ENERGY RELEASE TO A (DYNAMIC POWER) WORKING FLUID - SUCH AS MIGHT BE PERTINENT IN AN INTERFACE WITH A CLOSED CYCLE BRAYTON POWER MODULE, AND (c) THE PRELIMINARY DESIGN OF PHASE II EXPERIMENTAL HARDWARE FOR THE DEMONSTRATION TESTING OF A PILOT SCALE TES MODULE, AND - IF REQUIRED TO ENABLE A SELECTION BETWEEN TWO LEADING CANDIDATE FUSED SALT MEDIA - LABORATORY APPARATUS FOR MEASURING VARIOUS THERMAL PROPERTIES OF THE SALTS AND SALT EUTECTICS. THE COMPONENT PROPOSED FOR CONSIDERATION APPEARS TO HAVE THE CAPACITY FOR STORING APPROXIMATELY 300,000 JOULES OF THERMAL ENERGY PER LB OF SYSTEM MASS.

HUGHES ASSOCS INC

ARMY

\$ 26,018

2730 UNIVERSITY BLVD W - STE 902

WHEATON, MD 20902

GEORGE FIELDING

TITLE:

LIFE INDICATOR FOR CHEMICAL PROTECTIVE UNIFORMS

T 138 OFFICE: NRDC

FIVE CANDIDATE APPROACHES FOR DEVELOPING A FIELD TEST FOR DETER-

FISCAL YEAR 1986

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DEPT

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AMOUNT

MINING THE PROTECTIVE CAPACITY OF ACTIVATED CHARCOAL IN CHEMICAL PROTECTIVE CLOTHING ARE PROPOSED. THESE WILL BE EVALUATED WITH RESPECT TO FEASIBILITY, ABILITY TO DISCRIMINATE AND REPRODUCABILITY. A FINAL FIELD TEST "APPARATUS" AND PROCEDURE WILL BE RECOMMENDED CONSIDERING ALSO EASE OF USE, SIMPLICITY, COST, DURABILITY AND RELIABILITY.

HUGHES ASSOCS INC  
2730 UNIVERSITY BLVD W - STE 902  
WHEATON, MD 20902  
DR LEONARD A JONAS

ARMY

\$ 47,914

## TITLE:

SUPERADSORBENTS FOR GAS FILTERS

T 37

OFFICE: CRDC/AMSMC

THIS PROJECT WILL DEMONSTRATE THE FEASIBILITY OF A MIXED SORBENT FILL, INSTEAD OF A SINGLE COMPONENT, AS THE AIR PURIFICATION MEDIUM OF GAS FILTERS. ALTHOUGH THE DEVELOPMENT OF A SINGLE COMPONENT SUPERADSORBENT MIGHT BE FEASIBLE IN THE FUTURE, THE PROBABILITY OF A SUCCESSFUL PAYOFF IN THE PRESENT OR NEAR-TERM IS VERY LOW. THE USE OF A MIXED SORBENT, WHICH CAN MAXIMIZE PROTECTION AGAINST ALL KNOWN AND POTENTIAL CW AGENTS, WILL HAVE A HIGH PROBABILITY OF SUCCESS IN THE NEAR FUTURE.

HUMBUG MOUNTAIN RESEARCH LABS  
PO BOX 1380  
DUARTE, CA 91010  
DR ALAN A VETTER

NAVY

\$ 50,000

## TITLE:

LASER CENTERLINE LOCALIZER FOR CV AND CVN FLIGHT OPERATIONS

T 162

OFFICE: NAVAIR/NAEC

THE LASER CENTERLINE LOCALIZER TECHNIQUE (LCL) USES A SERIES OF LOW POWER, BUT HIGHLY VISIBLE LASER BEAMS TO ILLUMINATE APPROACH CORRIDORS FOR CV AND CVN FLIGHT OPERATIONS. BY TAKING ADVANTAGE OF THE ABILITY TO PRECISELY SHAPE AND DIRECT VISIBLE LASER BEAMS, AND BY ENCODING THE ILLUMINATED PATHS USING COLOR AND TEMPORAL FREQUENCY, IT IS POSSIBLE TO PROVIDE DIRECT VISUAL SIGNALS TO THE PILOT THAT INDICATE DEVIATIONS FROM THE CENTERLINE APPROACH. THIS SYSTEM PROVIDES A POSITIVE ON COURSE SIGNAL AND WELL AS THE DEGREE OF DEVIATION

FISCAL YEAR 1986

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AMOUNT

FROM THE PROPER APPROACH. BY USING THIS SYSTEM, THE PILOT WILL HAVE SIGNIFICANTLY IMPROVED VISUAL CUES, PARTICULARLY AT NIGHT AND IN MARGINAL WEATHER, TO AID IN THE SAFE RECOVERY OF THE AIRCRAFT. THIS RESEARCH PROGRAM IS DIRECTED AT PROVING THE VIABILITY OF THE LCL CONCEPT AND PROVIDING VISIBILITY DATA FOR THE OPTIMIZATION OF AN LCL SYSTEM DESIGN.

HY-TECH RESEARCH CORP

DNA

\$ 49,253

PO BOX 3422

RADFORD, VA 24143

ROBERT C HAZELTON

TITLE:

RESONANT HOLOGRAPHY TO STUDY PLASMA EROSION OPENING SWITCHES  
DEVELOPMENT

T

2

OFFICE: AM/SBIR

THE SPATIALLY RESOLVED PLASMA DISTRIBUTION BETWEEN THE ELECTRODES OF A PLASMA EROSION OPENING SWITCH (PEOS) DURING THE CLOSED AND OPENING PHASES OF THE SWITCH IS NEEDED TO UNDERSTAND SWITCH OPERATION. CONVENTIONAL HOLOGRAPHIC TECHNIQUES ARE NOT SUFFICIENTLY SENSITIVE TO STUDY THE 10 TO THE 13TH POWER/3cm PLASMA ENCOUNTERED HERE, AND ARRAYS OF LANGMUIR PROBES ARE REQUIRED TO OBTAIN SPATIALLY RESOLVED MEASUREMENTS. A RESONANT HOLOGRAPHIC TECHNIQUE IS PROPOSED TO MEASURE THE DISTRIBUTION OF IONS WITHIN THE PEOS. IN THIS, TECHNIQUE, THE HOLOGRAPHIC RADIATION SOURCE IS A LASER TUNED TO AN ELECTRONIC TRANSITION FREQUENCY. IN THIS CASE THE PHASE SHIFT PRODUCED BY A PLASMA INTRODUCED INTO ONE ARM OF A MACH ZENDER INTERFEROMETER IS PROPORTIONAL TO THE NUMBER OF ATOMS/IONS IN A LOWER ENERGY STATE OF THE TRANSITION PROBED. ESTIMATES INDICATED THAT POPULATION DENSITIES OF  $2 \times 10$  TO THE 12TH POWER/3cm OF NEUTRAL NEON ATOMS IN THE  $1s(2)$  STATE OR  $4 \times 10$  TO THE 11TH POWER/3cm NEON IONS IN THE  $3d\ 4f$  LEVEL CAN BE DETECTED IN A ONE cm PATH LENGTH. THIS TECHNIQUE CAN BE USED TO STUDY THE LASING LEVELS IN A GASEOUS LASER, ION DENSITIES IN RELATIVISTIC ELECTRON BEAM PROPAGATION EXPERIMENTS, RELAXATION PROCESSES IN SHOCK WAVES, COMBUSTION PRODUCTS IN FLAMES AND PLASMA DENSITIES IN PEOS IN A NONPERTURBING FASHION.

HYPERION CATALYSIS INTERNATIONAL INC

ARMY

\$ 48,377

128 SPRING ST

LEXINGTON, MA 02173

DR HOWARD G TENNENT

TITLE:

POLYHENYLENE STRUCTURAL POLYMERS

T

109

OFFICE: MICOM

HYPERION IS CURRENTLY DEVELOPING A FAMILY OF ECONOMICAL, THERMO-

FISCAL YEAR 1986

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OXIDATIVELY STABLE AND CHEMICALLY INERT POLYPHENYLENE RESINS. THESE RESINS ARE READILY PROCESSABLE AND CURE AT MODERATE TEMPERATURES WITHOUT THE EVOLUTION OF VOLATILES. PRELIMINARY INDICATIONS, BASED ON OUR OWN WORK, AND LITERATURE DATA ON RELATED POLYMERS, SUGGEST THAT POLYPHENYLENES WILL REQUIRE TOUGHENING, ESPECIALLY AT LOW TEMPERATURES IN ORDER TO QUALIFY AS HIGH-PERFORMANCE STRUCTURAL POLYMERS. THIS PROPOSAL CONTEMPLATES A RANGE OF STRATEGIES FOR TOUGHENING HYPERION'S POLYPHENYLENES BY THE INCLUSION OF RUBBERY DOMAINS. EVALUATION WILL BE VIA SIMPLE TENSILE PROPERTY TESTING.

HYPRES INC 175 CLEARBROOK RD ELMSFORD, NY 10523 SADEG M FARIS TITLE: SUPERCONDUCTING MILLIMETER WAVE PHASE SHIFTER T 56 OFFICE: RADC/DOR	AF	\$ 56,696
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BASED ON EXPERTISE IN ADVANCED SUPERCONDUCTING TECHNOLOGIES, HYPRES PROPOSES TO DEVELOP AND DEMONSTRATE SUPERCONDUCTING MICROSTRIP INTERFEROMETERS AS VERY BROADBAND, LOW POWER PHASE SHIFTERS SUITABLE FOR INCORPORATION INTO A MILLIMETER AND, ULTIMATELY, SUBMILLIMETER-WAVE PHASED ARRAY ANTENNAS. THIS UNIQUE PHASE SHIFTER COMBINES THE PHYSICS OF NON-EQUILIBRIUM SUPERCONDUCTIVITY WITH HIGH PERFORMANCE SUPERCONDUCTING TRANSMISSION LINES TO ACHIEVE CONTINUOUS MODULATION OF THE PHASE VELOCITY BY ELECTRONIC OR OPTICAL MEANS. PHASE SHIFTERS DESIGNED FROM THESE INTERFEROMETERS ARE EXPECTED TO PROVIDE EXTREMELY WIDE BANDWIDTHS (HUNDREDS OF GIGAHERTZ) AND VERY HIGH SPEED (SUBNANO-SECOND) RESPONSES FOR WAVELENGTHS LESS THAN ONE MILLIMETER. THE THIN FILM FABRICATION OF MICROSTRIP WILL ENSURE LARGE SCALE REPRODUCIBILITY AND PERMIT NUMEROUS CIRCUITS ON A WAFER AS REQUIRED FOR A LARGE NUMBER OF PHASE SHIFTERS. THE DEVELOPMENT OF A SUPERCONDUCTING PHASE SHIFTER FURTHER CONTRIBUTES TO THE ULTIMATE SYSTEM COST, SIZE AND RELIABILITY BENEFITS REALIZED FROM INTEGRATING MANY SUPERCONDUCTING COMPONENTS ON A SINGLE SUBSTRATE.

IAP RESEARCH, INC. 2763 CULVER AVE. DAYTON, OH 45429 JOHN P. BARBER, PHD TITLE: ADVANCED METAL ARMATURE DEVELOPMENT T 2 OFFICE:	SDIO	\$ 97,797
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THE EFFICIENCY OF RAILGUN LAUNCHERS IS A KEY ISSUE IN BOTH THE SIZE

FISCAL YEAR 1986

SUBMITTED BY  
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AND LIFE OF RAILGUN SYSTEMS. PLASMA ARMATURES ARE A MAJOR ENERGY LOSS COMPONENT AND PRODUCE SEVERE BORE EROSION. METAL ARMATURES OFFER INCREASED EFFICIENCY AND REDUCED BARREL EROSION IN SOME REGIMES OF OPERATION. THIS PROGRAM ADDRESSES THE USE OF ADVANCED COMPOSITE MATERIALS IN ARMATURES. THE GOAL IS TO PROVIDE HIGHLY EFFICIENT ARMATURES WHICH PRODUCE MINIMAL BARREL DAMAGE AT PERFORMANCE LEVELS OF INTEREST IN STRATEGIC MISSIONS.

IMI CORP.  
20 CRESTWOOD DR.  
ST. LOUIS, MO 63105  
JOEL D. ISAACSON, PHD

SDIO

\$ 50,538

TITLE:

DIALECTICAL SIGNAL PROCESSING APPLICATIONS TO MULTIPLE SENSOR  
TECHNOLOGIES

T 3

OFFICE:

THIS PROJECT IS DOMINATED BY PRE-EXISTING AND PENDING U.S. AND FOREIGN PATENTS ENTITLED "AUTONOMIC STRING-MANIPULATION SYSTEM." THE PATENTS ARE CONCERNED WITH METHODS AND MEANS FOR CONSTRUCTING A NOVEL BREED OF DIGITAL COMPUTING DEVICES WHICH ARE BASED ON A TYPE OF SIGNAL-PROCESSING DRIVEN BY DIALECTICAL LOGIC. DIALECTICAL INFORMATION PROCESSING IS A GENERIC MODE OF PATTERN PROCESSING WHICH IS APPLICABLE, AS SECOND STAGE, TO A LARGE VARIETY OF FRONT-END SIGNAL ACQUISITION TECHNOLOGIES. A DIALECTICAL IMAGE PROCESSOR (DIP) IS A TYPE OF ARTIFICIAL RETINA THAT CAN "SEE" PATTERNS TRANSMITTED BY A VERY BROAD RANGE OF THE ELECTROMAGNETIC SPECTRUM. THE OBJECT OF THIS EFFORT IS TO INVESTIGATE THE TECHNICAL FEASIBILITY OF DIP APPLICATIONS TO CERTAIN TYPES OF PATTERN RECOGNITION SCENARIOS.

IMPULSE ENGINEERING, INC.  
FIVE SCIENCE PARK  
NEW HAVEN, CT 06511  
DAVID V. TURNQUIST

SDIO

\$ 99,848

TITLE:

MEGAWATT THYRATRON CATHODES

T 5

OFFICE:

CATHODES FOR THYRATRON OPERATED AT 50 TO 500 AMPS AVERAGE AND 100,000 AMPS ARE REQUIRED FOR SDIO PROGRAMS, BUT CANNOT BE DESIGNED

FISCAL YEAR 1986

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AT THIS TIME BECAUSE OF THE LACK OF FUNDAMENTAL INFORMATION ON THE MECHANISMS OF EMISSION, CURRENT DISTRIBUTION AND HEATING. PREVIOUS DOD R&D PROGRAMS EXTENDED CONVENTIONAL THYRATRON TO THE MEGAWATT LEVEL, AND SHOWED THE FEASIBILITY OF COLD CATHODE, INSTANT START THYRATRON AT UP TO A HALF MEGAWATT, IN SHORT BURSTS. IMPULSE ENGINEERING PROPOSES TO CARRY FORWARD THE INVESTIGATIONS OF BASIC CHARACTERISTICS NEEDED TO BE ABLE TO DESIGN THE CORRECT SHAPES, SIZES, AND STRUCTURES OF VERY LARGE CATHODES. THE PROPOSED PROGRAM WILL EMPLOY A SERIES OF SMALL AND LARGE DEMOUNTABLE THYRATRON - LIKE STRUCTURES:

1. DETERMINE THE CHARACTERISTICS OF COLD THYRATON CATHODES.
2. PRODUCE A SCALING THEORY AND DESIGN CRITERIA FOR A VERY LARGE CATHODES.
3. VERIFY CATHODE DESIGN AT THE 50 AMP AVERAGE LEVEL.

IMPULSE ENGINEERING, INC.

SDIO

\$ 99,889

FIVE SCIENCE PARK

NEW HAVEN, CT 06511

BERNARD A. MCNULTY

TITLE:

MEGAWATT SOLID STATE MODULATOR

T 5 OFFICE:

A PROGRAM COMBINING STATE-OF-THE-ART, HIGH VOLTAGE, SOLID-STATE SWITCHING DEVICES WITH DISTRIBUTED CAPACITIVE AND INDUCTIVE PULSE FORMING SYSTEMS IS PROPOSED TO REALIZE A MODULAR PULSED POWER CONDITIONING SYSTEM FOR USE WITH A VARIETY OF ENVISIONED SDI SYSTEMS. WE PROPOSED TO CREATE A TEAM OF SENIOR, SCARCE, AND INTERNATIONALLY RECOGNIZED UNIVERSITY-INDUSTRY BASED, PULSED POWER AND SOLID-STATE SKILLS, AND TALENTS IN ORDER TO ACHIEVE THE OBJECTIVES OF THE PROGRAM: TO REALIZE A COMPACT, ENERGY EFFICIENT, MODULAR SOLID-STATE SYSTEM THAT IS CAPABLE OF CONTROLLING AND PROVIDING MEGAWATTS OF AVERAGE POWER AT THE 100 kV, 100 kA LEVEL. THREE MAJOR TECHNICAL OBJECTIVES ARE: 1. SELECT, IMPLEMENT AND DEVELOP SOLID-STATE SWITCH CANDIDATES FOR PULSED POWER APPLICATIONS. 2. FURTHER DEVELOP DISTRIBUTED PULSE TRANSFORMER/PFN SYSTEMS FOR USE IN COMPACT MODULATOR MODULES. 3. DEVELOP MODULATOR MODULE DESIGN CRITERIA AND LIMITATIONS.

INDEPENDENT SCIENTIFIC CORP

DARPA

\$ 40,480

4421 FESSENDEN ST NW

WASHINGTON, DC 20016

FRANK J LOPINTO

TITLE:

ULTRAFast COMPUTER SWITCHING

T 13 OFFICE: DARPA

WE PROPOSE TO DETERMINE THE FEASIBILITY OF DEVELOPING EXTREMELY FAST

FISCAL YEAR 1986

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<p>COMPUTER SWITCHING COMPONENTS BASED ON A METHOD OF USING LIGHT TO MODULATE ATOMIC TRANSITIONS. THE TECHNIQUE OF USING LIGHT TO MODULATE ATOMIC TRANSITIONS IS NOT NEW. LASERS OPERATE BY OPTICALLY STIMULATING A PREPARED SYSTEM TO UNDERGO ATOMIC TRANSITIONS. THE UNDERLYING PRINCIPLES OF ATOMIC PHYSICS HAVE BEEN UNDERSTOOD SINCE THE 1930s. WE PROPOSE TO INVESTIGATE THE POSSIBILITY OF APPLYING THESE PRINCIPLES IN THE FIELD OF COMPUTER ARCHITECTURE. ATTACHMENT ONE ENTITLED "A METHOD OF REPRESENTING BINARY INFORMATION BY MEANS OF STORING LIGHT" DESCRIBES A WAY OF IMPLEMENTING BIT STORAGE AND RETRIEVAL. AS PART OF THE INVESTIGATION WE WILL DEVELOP COMPUTER SOFTWARE TO SIMULATE THE PHYSICAL PROCESSES DESCRIBED IN ATTACHMENT ONE.</p>		

INDEX INDUSTRIES INC 13205 SE 30TH ST BELLEVUE, WA 98005 RICHARD L ENGLUND TITLE: DUAL LEVEL HIGH COOLANT TEMPERATURE WARNING SWITCH T 116                      OFFICE: TACOM/AMSTA	ARMY	\$ 29,481
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A HIGH TEMPERATURE WARNING SWITCH FOR ENGINE COOLING SYSTEMS IS CONCEIVED WHICH PROVIDES WARNING AT A RELATIVELY LOWER TEMPERATURE LEVEL (E.G. 212 DEGREE FAHRENHEIT) IF THE SYSTEM PRESSURE IS BELOW 7 PSIG AND AT A HIGHER TEMPERATURE LEVEL (E.G. 225 DEGREES FAHRENHEIT) IF THE SYSTEM PRESSURE IS ABOVE 7 PSIG. IN THE EVENT OF COOLING SYSTEM PRESSURE LOSS, THIS DUAL-LEVEL, PRESSURE DEPENDENT WARNING SWITCH PROVIDES PROTECTION NOT AFFORDED BY PRESENT SINGLE LEVEL HIGH TEMPERATURE SWITCHES. THE CONCEIVED DEVICE CONSISTS OF A DUAL-LEVEL TEMPERATURE SWITCH WITH A PRESSURE SWITCH INTERLOCK INCORPORATED IN THE LOWER LEVEL TEMPERATURE SWITCH CIRCUIT. IT IS CONFIGURED EQUIVALENT TO THAT OF MIL-S-12285/1 ENGINE MOUNTED TEMPERATURE SWITCHES. IT HAS SINGLE TERMINAL AND IS THUS A READY REPLACEMENT FOR EXISTING SINGLE-LEVEL TEMPERATURE WARNING SWITCHES.

INDUSTRIAL QUALITY INC PO BOX 2397 - 9832 CANAL RD GAITHERSBURG, MD 20879 HAROLD BERGER TITLE: IMPROVED GLASS X-RAY SCINTILLATOR T 127                      OFFICE: NWC/SSPO	NAVY	\$ 50,000
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REAL-TIME X-RAY IMAGING USED FOR DIAGNOSTIC STUDIES AND NONDE-



FISCAL YEAR 1986

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AMOUNT

STRUCTURE TESTING IS LIMITED IN TERMS OF IMAGE QUALITY BY THE STATISTICAL FLUCTUATIONS OF THE PHOTONS USED TO FORM THE IMAGE. THE LOW POINT IN THE STATISTICAL EVALUATION OF A MODERN REAL-TIME X-RAY IMAGE IS USUALLY SET BY THE ABSORPTION OF THE IMAGE-FORMING X-RAY PHOTONS IN THE PRIMARY X-RAY DETECTOR, NORMALLY AN X-RAY-TO-LIGHT CONVERSION SCREEN. THE IMAGE STATISTICS AND THE RESULTANT IMAGE QUALITY COULD BE IMPROVED IF THE DETECTOR USEFULLY ABSORBED A LARGER PERCENTAGE OF X-RAY IMAGE-FORMING PHOTONS. THIS PROPOSAL IS DIRECTED TOWARD THAT OBJECTIVE THROUGH THE DEVELOPMENT OF A NEW HIGH DENSITY, X-RAY SCINTILLATING GLASS AS AN X-RAY-TO-LIGHT CONVERSION SCREEN. AN ANALYSIS OF HIGH ATOMIC NUMBER ADDITIVES AND OTHER CONSTITUENTS OF SCINTILLATING GLASSES WILL BE MADE AND WILL LEAD TO THE SELECTION OF SEVERAL PROMISING GLASS SCINTILLATOR COMPOSITIONS FOR EXPERIMENTAL TASKS. IT IS PROPOSED THAT SEVERAL OF THE MORE PROMISING MATERIAL COMBINATIONS BE PREPARED AS GLASS BUTTONS FOR X-RAY DETECTION TESTS AT X-RAY ENERGIES IN THE RANGE FROM 40 TO 400 kV. THE EXPERIMENTAL TESTS WILL INCLUDE DATA ON DETECTION EFFICIENCY, LIGHT OUTPUT AND DECAY CHARACTERISTICS. COMPARISONS WILL BE MADE WITH CONVENTIONAL X-RAY-TO-LIGHT CONVERSION MATERIALS. THE PHASE I PROGRAM WILL LEAD TO THE BACKGROUND NECESSARY TO DESIGN A PROGRAM FOR THE PREPARATION OF A LARGE AREA, HIGH DETECTION EFFICIENCY, X-RAY CONVERSION SCREEN USEFUL IN SEVERAL X-RAY ENERGY RANGES.

INDUSTRIAL QUALITY INC  
PO BOX 2397 - 9832 CANAL RD  
GAITHERSBURG, MD 20879  
HAROLD BERGER

NAVY

\$ 49,973

## TITLE:

INFRARED INSPECTION OF SPOT WELDS

T 186

OFFICE: NSRDC

A RELIABLE NONDESTRUCTIVE TESTING (NDT) METHOD TO INSPECT SPOT WELDS IN STAINLESS STEEL WILL CLEAR THE WAY TO INCREASED USE OF THESE LIGHT-WEIGHT, HIGH STRENGTH CORRUGATED STAINLESS STEEL SPOT WELDED PANELS IN SHIP AND OTHER CONSTRUCTION. AN INFRARED METHOD FOR INSPECTION OF STAINLESS STEEL SPOT WELDS IS PROPOSED. THE PROJECT BUILDS ON THE EXTENSIVE EXPERIENCE OF THE PROJECT TEAM AS RELATED TO INFRARED INSPECTION OF NON-METALS SUCH AS HONEYCOMB AND COMPOSITE STRUCTURE. THE APPROACH WILL MAKE USE OF EXISTING INFRARED INSPECTION EQUIPMENT BUT WILL ADAPT THE PROCEDURE IN TERMS OF HEAT INPUT, TIME LAPSE FOR MAXIMUM INFRARED SIGNAL AND ANALYSIS OF DATA TO SHOW

FISCAL YEAR 1986

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<p>FEASIBILITY FOR THE INSPECTION OF SPOT WELDS IN STAINLESS STEEL. THE INFRARED RESULTS WILL BE COMPARED TO DATA FOR DESTRUCTIVE TESTS OF SEVERAL SPOT WELDS THEREBY OFFERING INCREASED CONFIDENCE IN THE INSPECTION RESULTS. PRELIMINARY WORK ON SPOT WELDS HAS CLEARLY SHOWN THE POTENTIAL OF THIS TECHNIQUE FOR INSPECTION AND THE SORTING OF SPOT WELD QUALITY OVER THE SPOT WELDS AFTER FABRICATION, BOTH IN PRODUCTION AND MAINTENANCE. HOWEVER, THE POTENTIAL FOR MONITORING SPOT WELD QUALITY DURING FABRICATION AND USING AUTOMATIC FEEDBACK TO VARY WELD PARAMETERS IS RECOGNIZED.</p>		

INET CORP 8450 CENTRAL AVE NEWARK, CA 94560 PETER J ENRIGHT TITLE: UNIVERSAL ENGINE HISTORY RECORDER T 45 OFFICE: AVSCOM/AMSAV	ARMY	\$ 54,681
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THERE IS A NEED FOR A UNIVERSAL ENGINE HISTORY RECORDER THAT IS COMMON TO SEVERAL ENGINES. WITH THE CURRENT TECHNOLOGICAL ADVANCES IN ELECTRONICS AND MICROPROCESSORS, IT MAY BE POSSIBLE TO REPLACE CURRENT ENGINE HISTORY RECORDERS WITH ONE INCORPORATING THE NEW ADVANCES. IN A MICROPROCESSOR BASED RECORDER IT MAY BE POSSIBLE TO ACCOMMODATE SEVERAL ENGINE TYPES, IF NOT ALL, WITH ONE RECORDER. IN ADDITION TO THE ABILITY TO RETAIN MORE DETAILED INFORMATION THAN CURRENTLY IS RETAINED, AN ATTENDANT COST SAVINGS CAN BE REALIZED WHEN ONLY ONE MODEL IS REQUIRED AND SPARES ARE ACQUIRED AND STOCKED FOR THE ONE MODEL.

INFORMATION RESEARCH LAB INC 415 BRADFORD PL NORTH DARTMOUTH, MA 02747 DR C H CHEN TITLE: HIGH RESOLUTION SPECTRAL ANALYSIS NDE TECHNIQUES FOR FLAW CHARACTERIZATION PREDICTION AND DISCRIMINATION T 132 OFFICE: LABCOM/MTL	ARMY	\$ 44,000
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THE METHOD OF ULTRASONIC SPECTROSCOPY HAS BEEN PROVEN TO BE EFFECTIVE IN NONDESTRUCTIVE EVALUATION OF STRUCTURAL MATERIALS OF INTEREST

FISCAL YEAR 1986

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TO US ARMY. MUCH IMPROVEMENT OF THE METHOD CAN BE DERIVED FROM THE CURRENT ADVANCES IN DIGITAL SIGNAL PROCESSING, MODERN SPECTRAL ANALYSIS, AND DIGITAL PATTERN RECOGNITION. THE PHASE I STUDY MAKES EXTENSIVE USE OF THE MAXIMUM ENTROPY SPECTRAL ANALYSIS TO IMPROVE THE CAPABILITY IN FLAW CHARACTERIZATION, PREDICTION AND DISCRIMINATION. INDEED ALMOST ALL DESIRED INFORMATION ABOUT THE FLAWS CAN BE EXTRACTED EFFECTIVELY FROM THE MAXIMUM ENTROPY SPECTRAL ANALYSIS. THE PHASE I STUDY PROVIDES THEORETICAL AND EXPERIMENTAL FOUNDATIONS FOR EXTENSIVE TESTING OF ALGORITHMS IN PHASE II IN AN EFFORT TO DEVELOP AND IMPLEMENT A HIGHLY RELIABLE NONDESTRUCTIVE EVALUATION SYSTEM.

INFORMATION SYSTEMS LABS 6870 ELM ST - STE 300 MCLEAN, VA 22101 JOHN E DON CARLOS TITLE: SKYWAVE HFDF CRITICAL NODES T 53 OFFICE: CECOM/AMSEL	ARMY	\$ 57,506
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ISL PROPOSES TO DEVELOP AN INTERACTIVE MODEL FOR THE IBM PC AND EXERCISE THIS MODEL TO: EVALUATE THE POTENTIAL ACCURACY OF ALTERNATIVE ANGLE OF ARRIVAL AND TDOA TECHNIQUES; EVALUATE THE TRADEOFFS BETWEEN COMPUTATIONAL TIME AND ACCURACY AFFORDED BY ALTERNATIVE IONOSPHERIC AND PROPAGATION MODELS; EVALUATE THE VALUE OF ALTERNATIVE SOURCES OF REAL TIME IONOSPHERIC INFORMATION; EVALUATE THE TIMELINESS AND THROUGHPUT OF ALTERNATIVE HFDF SYSTEM CONFIGURATIONS; ESTIMATE THE ACCURACY OF A LOCATION ESTIMATE PRODUCED BY A GIVEN COMBINATION OF HFDF ASSETS FOR A TARGET OF SPECIFIED CHARACTERISTICS AND RANGE. NOVEL CONCEPTS DEVELOPED BY ISL FOR HFDF INTERCEPT INCORPORATING THINNED ADAPTIVE ANTENNA ARRAYS AND TDOA PROCESSING WILL ALSO BE EVALUATED.

INNOVATIVE INSTRUMENTS INC 15 KENDRICK DR WAREHAM, MA 02571 JEFFREY S RUSSELL TITLE: AUTOMATIC INFLATION DEVICES FOR LIFE PRESERVERS T 184 OFFICE: NSRDC	NAVY	\$ 52,914
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THERE IS AN INCREASING NEED IN THE NAVY TODAY FOR AN AUTOMATIC

FISCAL YEAR 1986

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INFLATION DEVICE WHICH IS INEXPENSIVE, RELIABLE AND REUSABLE AFTER REARMING. THE FOCUS OF AN ENGINEERING DEVELOPMENT PROGRAM DESIGNED AT DEVELOPING THE DEVICE IS TO DESIGN A MECHANICAL INFLATION SYSTEM WHOSE SCOPE INCLUDES HUMIDITY TESTING AND CORROSION RESISTANCE AS WELL AS COMPATIBILITY WITH EXISTING LIFE PRESERVER MANIFOLDS AND CARBON DIOXIDE UNITS IN THE FLEET.

INNOVATIVE SCIENCES INC  
400 HESTER ST  
SAN LEANDRO, CA 94577  
DR B W MAXFIELD

AF

\$ 49,980

## TITLE:

SURFACE FLAW AND GRAIN CHARACTERIZATION USING ACOUSTIC MICROSCOPY  
T 159 OFFICE: AFWAL/ML

IT IS CLEAR FROM RECENT PUBLISHED ARTICLES THAT THE GENERATION OF SURFACE WAVES MUST BE CONSIDERED WHEN INTERPRETING MEASUREMENTS MADE USING A WIDE-ANGLE, FOCUSED-BEAM, REFLECTION-MODE ACOUSTIC MICROSCOPE. THERE EXISTS MUCH NEW AND USEFUL INFORMATION IN THESE SURFACE WAVES AND UNDERSTANDING THEM IN A MORE QUANTITATIVE MANNER WOULD OPEN NEW AVENUES IN THE NONDESTRUCTIVE EVALUATION OF SURFACE AND NEAR-SURFACE CHARACTERISTICS. IN PARTICULAR, THESE SURFACE WAVES WILL BE ABLE TO MEASURE THE THICKNESS OF THIN COATINGS, MAP CHANGES IN SURFACE RESIDUAL STRESSES AND DETECT AND QUANTIFY SMALL FATIGUE CRACKS. THIS PROPOSAL DESCRIBES HOW MEASUREMENTS ON SPECIMENS THAT REPRESENT FOUR DISTINCT CLASSES OF MATERIALS PROBLEMS SHOULD LEAD TO A ROTATIONAL PHASE II APPROACH TO UNDERSTANDING THE SURFACE WAVE ROLE IN ACOUSTIC MICROSCOPE MEASUREMENTS. THIS PROPOSAL ALSO SEEKS TO DEVELOP A HIGHLY QUANTITATIVE DESCRIPTION OF THE COMPLEX BUT HIGHLY REPRODUCIBLE ACOUSTIC MATERIALS SIGNATURE (AMS) SO THAT A MORE QUANTITATIVE DESCRIPTION OF MATERIALS PROPERTIES CAN BE OBTAINED.

INNOVATIVE SCIENCES, INC.  
400 HESTER ST.  
SAN LEANDRO, CA 94577  
B. W. MAXFIELD, PHD

SDIO

\$ 49,980

## TITLE:

ELECTROMAGNETIC DAMPING AND VIBRATION ISOLATION OF SPACE STRUCTURES  
T 11 OFFICE:

CONVENTIONAL APPROACHES TO VIBRATION DAMPING AND ISOLATION USE

FISCAL YEAR 1986

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MEMBERS COUPLED BY VISCOUS GAS OR LIQUID FLOW. SUCH FLUIDS PRESENT MANY OPERATIONAL DIFFICULTIES IN A SPACE ENVIRONMENT. THIS PROPOSAL DESCRIBES ELECTROMAGNETIC METHODS THAT CAN BE USED TO CONVERT MECHANICAL ENERGY TO HEAT (DAMPING) AND TO CONTROL THE MOMENTUM TRANSFER FROM ONE SUBSYSTEM TO ANOTHER (ISOLATION). SEMI-QUANTITATIVE THEORY HAS BEEN DEVELOPED AND TESTED BY PERFORMING TWO EXPERIMENTS. FROM THIS INFORMATION, IT IS CLEAR THAT ELECTROMAGNETIC FORCES CAN BE EXTREMELY EFFECTIVE IN DAMPING MECHANICAL RESONANCES AND IN CONTROLLING THE MOMENTUM TRANSFER WITHIN A STRUCTURE. THESE FEATURES CAN BE ACHIEVED IN PASSIVE APPROACHES USING LAMINATED METALS AND PROPERLY DESIGN PERMANENT MAGNET STRUCTURES OR IN ACTIVE SYSTEMS USING ELECTROMAGNETS DRIVEN BY POWER SUPPLIES CONTROLLED BY POSITION AND VELOCITY SENSORS.

INNOVATIVE TECHNOLOGY INC  
BOX 10072 - SOUTHERN STA  
HATTIESBURG, MS 39406  
WILLARD L DOUGLAS

ARMY

\$ 49,062

## TITLE:

AN ENZYME CYCLING IMMUNOASSAY FOR VIBRIO CHOLERAЕ DEVELOPMENT  
T 210 OFFICE: AMRDC/SGRD

MILITARY PERSONNEL ARE AT RISK TO VARIOUS FORMS OF GASTROENTERITIS AS THEY ARE TRANSFERRED TO PARTS OF THE WORLD WHERE CONDITIONS FAVOR CONTAMINATION OF FOOD OR WATER WITH THE CAUSATIVE AGENTS. MANY OF THESE FORMS OF GASTROENTERITIS ARE SELF LIMITING, BUT VIBRIO CHOLERAЕ IS THE CAUSATIVE AGENT OF A SEVERE FORM OF GASTROENTERITIS WHICH CAN BE FATAL IF UNTREATED. IT IS THE GOAL OF THIS PROJECT TO DEVELOP A HIGHLY SENSITIVE IMMUNOASSAY WITH AN AMPLIFIED INDICATOR SYSTEM FOR DETECTION OF VIBRIO CHOLERAЕ IN CLINICAL OR ENVIRONMENTAL SAMPLES. HIGHLY SPECIFIC MONOCLONAL ANTIBODIES WILL BE PRODUCED AGAINST THE ORGANISM, AND CONJUGATED OF THESE ANTIBODIES WILL BE PREPARED FOR USE IN THE DETECTION SYSTEM. THE ASSAY WILL BE DEVELOPED IN VACUUM MICROWELL FORMAT. VARIOUS METHODS OF RAPIDLY EXTRACTING AND CONCENTRATING VIBRIOS FROM SAMPLES AND IMMOBILIZING THEM ON THE MICROWELL MEMBRANES WILL BE COMPARED AND OPTIMIZED. CONCENTRATION METHODS EVALUATED WILL INCLUDE IMMUNOAFFINITY, AND IMMOBILIZATION METHODS EVALUATED WILL INCLUDE FILTRATION IMPINGEMENT, ANTIBODY CAPTURE, AND METAL OXIDE IMMOBILIZATION. EXTRACTION/CONCENTRATION AND ENZYME IMMUNOASSAY PROTOCOLS WILL BE EVALUATED USING SEEDED CLINICAL AND ENVIRONMENTAL SAMPLES.

FISCAL YEAR 1986

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INSTITUTE FOR HYPERSONIC STUDIES INC 3911 COOPER ST HUNTSVILLE, AL 35801 ROBERT D KIRCHNER TITLE: EFFECTIVE TEMPERATURE MATHEMATICAL MODEL T 176 OFFICE: TECOM/WSMR	ARMY	\$ 9,723

A PROPOSAL IS MADE TO DEVELOP A MATHEMATICAL MODEL OF THE NOMOGRAPH PRESENTED IN MIL-STD-1472C. THE MODEL WILL BE BASED UPON A MATHEMATICAL RELATIONSHIP DEVELOPED IN PRELIMINARY STUDIES THAT EXPRESSES THE EFFECTIVE TEMPERATURE AS A FUNCTION OF THE DRY BULB AND WET BULB TEMPERATURES AND THE AIRSTREAM VELOCITY. THE MODEL WILL ELIMINATE THE NEED TO MANUALLY INTERPOLATE DATA FROM THE CURRENT NOMOGRAPH AND ALLOW THE EFFECTIVE TEMPERATURE TO BE CALCULATED DIRECTLY WITH A SIMPLE COMPUTER ALGORITHM AND ON A HAND HELD CALCULATOR.

INSTITUTE FOR SYSTEMS ANALYSIS 7209 ARMAT DR BETHESDA, MD 20817 DR DAVID S ALBERTS TITLE: ADA COST ESTIMATING MODEL T 43 OFFICE: ESD/XRCT	AF	\$ 48,398
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THE OBJECTIVE OF THE PROPOSED RESEARCH IS TO PRODUCE A LIFE CYCLE COST MODEL SPECIFICALLY FOR SYSTEMS DESIGNED AND DEVELOPED IN ADA. THIS MODEL WILL SIGNIFICANTLY DIFFER FROM TODAY'S COST MODELS IN A NUMBER OF IMPORTANT AREAS. A SIZING FRONT END WILL BE PROVIDED TO TAKE INPUT FROM THE CHARACTERISTICS OF FUNCTIONAL SPECIFICATIONS, RATHER THAN REQUIRING THE TYPICAL LINES OF CODE ESTIMATES. THE MODEL WILL GENERATE OUTPUTS FOR EACH PHASE THAT INCLUDE COSTS, PRODUCTIVITY AND QUALITY MEASURES THAT ARE USED (IF UNALTERED BY THE USER) AS INPUTS TO SUBSEQUENT PHASES. THIS WILL ALLOW THE MODEL TO BE CALIBRATED AND USED TO ACCURATELY PROJECT COST TO COMPLETION INCORPORATING ACTUAL EXPERIENCE TO DATE (INCLUDING THE QUALITY OF THE PRODUCTS PRODUCED) RATHER THAN SIMPLY THE COSTS EXPENDED.

FISCAL YEAR 1986

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INTEGRATED SOFTWARE INC BOX 295 PALM BAY, FL 32905 GREG SAUNDERS TITLE: ADA COST ESTIMATING MODEL T 43 OFFICE: ESD/XRCT	AF	\$ 49,477

A PROJECT IS PROPOSED TO DEFINE THE PARAMETERS AND EQUATIONS REQUIRED FOR A COST ESTIMATING MODEL "TUNED" TO ADA SOFTWARE DEVELOPMENT AND MAINTENNACE. IT IS PROPOSED TO DEFINE A STANDARD FOR AN ADA LINE OF CODE (LOC) AS THE BASIC DRIVER IN THE COST ESTIMATION MODEL. THE EFFECT OF PRODUCTIVITY TOOLS BEING DEVELOPED FOR ADA WILL ALSO BE CONSIDERED. THE PROJECT PROPOSES TO GATHER EMPIRICAL DATA FROM ON-GOING AND COMPLETED LARGE SCALE ADA SOFTWARE DEVELOPMENT EFFORTS AS A DATABASE FOR THE MODEL. IT FURTHER PROPOSES TO EVALUATE THE COMMERCIAL POTENTIAL OF A COST ESTIMATING MODEL DEVELOPED IN THE ADA PROGRAMMING LANGUAGE WHICH WOULD RESIDE AS A SOFTWARE TOOL IN THE STANDARDIZED ADA PROGRAMMING SUPPORT ENVIRONMENT (APSE).

INTEGRATED SYSTEMS INC 101 UNIVERSITY AVE PALO ALTO, CA 94301 P K MENNON TITLE: GRAPHICAL OPTIMIZATION FOR MISSILE LAYOUT AND WEAPON PHYSICAL FIT ON AIRCRAFT T 32 OFFICE: AD	AF	\$ 73,741
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PHYSICAL LAYOUT OF SUBMUNITIONS IN MISSILES AND WEAPONS IN AIRCRAFT IS CURRENTLY DONE BY TRAIL AND ERROR. OPTIMIZATION-BASED LAYOUT TOOLS COULD HELP TO AUTOMATE THAT PROCESS, THEREBY IMPROVING MISSION PERFORMANCE OF THE MISSILES OR AIRCRAFT AS WELL AS THE PRODUCTIVITY OF THE DESIGNER. THE OVERALL PROCESS OF AIRCRAFT OR MISSILE DESIGN WOULD BENEFIT SIGNIFICANTLY BY FURTHER LINKING OF THE LAYOUT OPTIMIZATION SOFTWARE TO AERODYNAMICS AND RADAR PREDICTIONS CODES.

INTEGRATED SYSTEMS INC 101 UNIVERSITY AVE PALO ALTO, CA 94301 ROBERT A WALKER TITLE: INTEGRATING ARTIFICAL INTELLIGENCE AND TRAJECTORY GUIDANCE TO ACHIEVE ROBOTIC TASK PLANNING/CONTROL T 28 OFFICE: ARC/SMCAR	ARMY	\$ 78,110
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LITTLE HAS BEEN DONE TO CONTROL ROBOTS IN AN INTELLIGENT MANNER

FISCAL YEAR 1986

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AMOUNT

WHICH TRULY INVOLVES FEEDBACK TRAJECTORY CONTROL LAWS. IT WILL NOT BE POSSIBLE TO ACHIEVE THIS FOR EVERY SUBTASK, BUT WHERE POSSIBLE, DRAMATIC PERFORMANCE IMPROVEMENTS WILL BE ACHIEVED. HEURISTIC RULE-BASED APPROACHES WILL BE COHERENTLY INTEGRATED WITH THE OPTIMIZATION BASED TECHNIQUES. THE PROPOSED RESEARCH WILL ANALYZE A WIDE ENOUGH RANGE OF SUBTASKS, SO THAT A COERENT CONTROL STRATEGY FOR QUITE COMPLEX TASKS CAN BE SYNTHESIZED. CODE GENERATION TOOLS CURRENTLY NEARING COMPLETION AT INTEGRATED SYSTEM, INC. (ISI) WILL ENABLE THE SPECIFICATION OF THE CURRENT PROCESSES WHICH INTEGRATE TASK PLANNING AND CONTROL TIGHTLY TO BE AUTOMATICALLY GENERATED AND IMPLEMENTED IN PHASE II WITH MULTIPLE PROCESSORS. PHASE I WILL SPECIFY AND SOLVE TO THE EXTENT POSSIBLE SET OF BOTTOM LEVEL SUBTASK VIA MATHEMATICAL MODELING AND OPTIMIZATION WHERE POSSIBLE. THE PERFORMANCE OF THESE CONTROL LAWS WILL BE DEMONSTRATED AND EVALUATED WITH SIMULATION TOOLS CURRENTLY UNDER DEVELOPMENT. THE PROPOSED RESEARCH WILL DEVELOP A FUNDAMENTAL INTEGRATION OF AI METHODS WITH FEEDBACK TRAJECTORY GUIDANCE SUCH THAT MUCH MORE COMPLEX TASKS CAN BE EFFICIENTLY PROGRAMMED AND SOLVED BY THE COMBINED ROBOT PLANNER AND CONTROL SYSTEM.

INTEGRATED SYSTEMS INC  
101 UNIVERSITY AVE  
PALO ALTO, CA 94301  
ROBERT L KOSUT

AF

\$ 73,679

TITLE:

SYNTHESIS OF ROBUST CONTROL

T 12 OFFICE: AFOSR/XOT

THE OBJECTIVE OF THE PRESENT PROPOSAL IS THE DEVELOPMENT OF SOME MATHEMATICAL AND COMPUTATIONAL TOOLS THAT ARE APPROPRIATE TO THE NEXT GENERATION OF CAD (COMPUTER-AIDED DESIGN) ENVIRONMENTS. THESE CAD PACKAGES WILL BE RADICALLY DIFFERENT THAN THE PRESENT ANALYSIS PACKAGES IN THAT THEY WILL TRULY BE ABLE TO PERFORM CONTROL SYSTEM SYNTHESIS. IN ORDER FOR THIS IDEAL SITUATION TO COME ABOUT, IT IS NECESSARY FIRST TO SOLVE SOME IMPORTANT PROBLEMS IN THE MATHEMATICS OF CONTROL SYSTEMS AS WELL AS IN COMPUTATIONAL TECHNIQUES. PHASE I OF THE PROPOSED RESEARCH PROGRAM IS ADDRESSED TO STUDYING THE FEASIBILITY OF SOLVING SOME OF THE PROBLEMS. AMONG THE PROBLEMS WE PROPOSE TO STUDY ARE THE FOLLOWING: (i) NEW APPROACHES TO THE SIMULTANEOUS STABILIZATION PROBLEM, (ii) UNCERTAINTY MODELLING, (iii) NUMERICAL TECHNIQUES FOR CONSTRAINED OPTIMIZATION PROBLEMS, AND (iv)



FISCAL YEAR 1986

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STABILITY OF REDUCED ORDER ADAPTIVE CONTROL. THESE PROBLEMS ARE INTIMATELY CONNECTED, EACH PROBLEM BEING AN ESSENTIAL TASK IN A TYPICAL INTERACTIVE CAD PROCEDURE.

INTEGRITY SYSTEMS INC 31 MIDDLECOT ST BELMOND, MA 02178 DR NEAL A CARLSON TITLE: DISTRIBUTED KALMAN FILTER ARCHITECTURES T 117 OFFICE: AFWAL/AA	AF	\$ 49,990
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THIS INVESTIGATION WILL DEVELOP DISTRIBUTED KALMAN FILTER ARCHITECTURES APPLICABLE TO MULTI-SENSOR INTEGRATED NAVIGATION SYSTEMS TYPICAL OF THOSE ENVISIONED FOR ADVANCED TACTICAL AIRCRAFT. WHILE THESE MULTI-SENSOR NAVIGATION SYSTEMS POTENTIALLY PROVIDE HIGH LEVELS OF ACCURACY, A NUMBER OF DIFFICULTIES CAN ARISE WHEN CLASSICAL KALMAN FILTERING TECHNIQUES ARE APPLIED. THESE DIFFICULTIES INCLUDE POOR ACCURACY, LOSS OF STABILITY, AND/OR SEVERE COMPUTATIONAL BURDENS IN VARIOUS DEGREES. THE FILTER ARCHITECTURES AND DESIGN TECHNIQUES DEVELOPED HERE WILL CIRCUMVENT OR AMELIORATE THESE DIFFICULTIES. SPECIFIC ARCHITECTURES TO BE DEVELOPED INCLUDE MULTI-RATE FILTERS, CASCADED FILTERS, AND DISTRIBUTED (DECENTRALIZED) FILTERS.

INTELLIGENT SIGNAL PROCESSING 6300 LA CALMA DR AUSTIN, TX 78752 DR JAE Y HONG TITLE: NONLINEAR RADAR CONCEPT DEVELOPMENT T 94 OFFICE: ASD/XR	AF	\$ 0
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THE PRIMARY EFFECTIVENESS OF RADAR DEPENDS UPON THE STRENGTH OF RADAR CROSS SECTION (RCS) OF A TARGET. THEREFORE, GREAT EFFORTS ARE CONCENTRATED ON THE REDUCTION OF A TARGET'S RCS TO INCREASE ITS SURVIVABILITY AGAINST HOSTILE RADAR. HOWEVER, THIS RCS IS THE ONLY LINEAR PART OF THE GENERALIZED RCS'S BASED ON OUR PROPOSED NONLINEAR RADAR SYSTEM. THUS, THE STUDY OF ITS OTHER HIGHER-ORDER RCS'S IS DESIRABLE TO ENHANCE ITS SURVIVABILITY AGAINST A NONLINEAR RADAR SYS-

FISCAL YEAR 1986

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<p>TEM, IF IMPLEMENTED IN FUTURE. AT THE SAME TIME, WITH THIS NEW RADAR SYSTEM IT IS ALSO POSSIBLE TO DETECT AND IDENTIFY A HOSTILE TARGET WITH LOW CONVENTIONAL RCS, IN TERMS OF HIGHER-ORDER RCS'S. IT IS THE PRINCIPAL OBJECTIVE OF THIS PROPOSAL, AS A FIRST STEP, TO EXAMINE THE FEASIBILITY OF MODELLING A MORE REALISTIC NONLINEAR TARGET IN TERMS OF NONLINEAR RCS'S AND IMPLEMENTING AN APPROPRIATE COMPUTER ALGORITHM SUCH THAT THESE NONLINEAR RCS'S MAY BE COMPUTED DIRECTED FROM THE TRANSMITTED AND RECEIVED SIGNALS MORE EFFICIENTLY.</p>		

INTERA TECHNOLOGIES INC  
6850 AUSTIN CTR BLVD - STE 300  
AUSTIN, TX 78731  
DR JOHN WILLIAMS

AF

\$ 49,258

## TITLE:

DYNAMIC SOIL ANALYSIS BY INTERGRANULAR ASSOCIATION  
T 296 OFFICE: AFESC/RDXP

THE DISCRETE ELEMENT METHOD WILL BE APPLIED TO SIMULATE THE DYNAMIC RESPONSE OF SOIL BY MODELING THE SOIL AS A DISCRETE GRANULAR MATERIAL. THE INTERACTION AND MOTION OF EACH SOIL GRAIN WILL BE MODELED EXPLICITLY. THE PROGRAM AUTOMATICALLY TRACKS THE MOTION OF EACH GRAIN. A PARAMETRIC STUDY WILL BE UNDERTAKEN TO DETERMINE THE DEPENDENCE OF MACROSCOPIC SOIL BEHAVIOR ON MICROSCOPIC PROPERTIES. AN EQUIVALENT CONTINUUM CONSTITUTIVE BEHAVIOR WILL BE DETERMINED FOR SOIL UNDER DYNAMIC LOADING CONDITIONS.

INTERACTIVE CNC SYSTEMS INC  
1706 E WILLOW GROVE AVE  
PHILADELPHIA, PA 19118  
SAMUEL C RATMANSKY

AF

\$ 0

## TITLE:

USE OF NEW COMPUTER CONTROLLED EDM TO IMPROVE EDM SURFACE FINISH AND CUTTING SPEED ON CRITICAL PARTS OF JET ENGINES EDM MACHINED  
T 104 OFFICE: ASD/YZ

THERE IS A PROBLEM IN ELECTRICAL DISCHARGE MACHINING (EDM) OF CRITICAL JET ENGINE PARTS DUE TO THE METALURGICAL DAMAGE TO THE SURFACE FINISH OF THE AREAS CUT BY EDM. EXTREME CARE MUST BE TAKEN, AND EDM CUTTING SPEED REDUCED NOT TO DAMAGE CRITICAL PARTS. EDM OPERATOR SKILLS AND ATTENTION HAVE SIGNIFICANT RELATIONSHIP TO QUALITY OF EDM

FISCAL YEAR 1986

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WORK ON EXPENSIVE COMPONENTS. WE HAVE INVENTED A COMPUTER CONTROLLED EDM POWER SUPPLY WITH SUPER HIGH SPEED COMPONENTS, ADAPTIVE CONTROLS, DATA BASE, REMOTE VIEWING AND CONTROL THAT LENDS ITSELF TO RETRO-FITTING TO OLDER EDM MACHINE TOOLS IN JET ENGINE PLANTS SUCH AS GENERAL ELECTRIC, PRATT & WHITNEY, AVCO, ALLISON AND GARRETT. WE WISH TO DO A TRIAL RUN OF PARTS TO BE SELECTED BY WRIGHT-PATTERSON IN CO-OPERATION WITH AN ENGINE FIRM, OR WITH W-P, TO PROVE OUT OUR QUALITY ENHANCEMENT AS WELL AS COST REDUCTION, AND TO BUILD THE DATA BASE FOR FUTURE USEAGE. WE SEE SIGNIFICANT COST SAVINGS AND QUALITY IMPROVEMENTS FROM THESE TESTS THAT WILL MAKE PHASE II WORTHWHILE TO PURSUE. WE ARE INTERESTED IN SMALL COOLING HOLE DRILLING APPLICATIONS TOO.

INTERACTIVE VIDEODISC CORP OF AMERICA  
2023 GORDON AVE  
MENLO PARK, CA 94025  
EDMUND C PERRY

NAVY

\$ 50,000

TITLE:

TARGET ACQUISITION TRAINER

T 168

OFFICE: NAVAIR/NTEC

THE AIRCREW TRAINING PROBLEM IS ONE OF EFFECTIVENESS VERSUS AFFORDABILITY. REALISTIC EXPERIENCE CAN BE ACHIEVED WITHOUT EXPENDING JP-4 AND STORES. FLIGHT SIMULATORS NO LONGER HAVE TO BE PROHIBITIVELY EXPENSIVE. COMPUTER GRAPHICS MERGED WITH DYNAMIC TARGET IMAGERY PROVIDE AN INTERACTIVE TRAINING CAPABILITY AT LOW COST FOR A STAND-ALONE SYSTEM WITH BUILT-IN INSTRUCTOR. IN THE PROPOSED PROGRAM, ADVANCED DEVELOPMENT WILL BE CONDUCTED TO RESULT IN A COMPUTERIZED TARGET ACQUISITION TRAINER (TAT). ADVANCED TECHNOLOGY WILL PROVIDE CAPABILITY FOR REAL-TIME FEEDBACK OF REALISTIC VISUAL IMAGERY TO TRAINEE TO PERMIT HIM TO LEARN FROM SIMULATED TARGET RUNS ON A TRIAL AND ERROR BASIS WITH VARIABLE EW AND NAVIGATION PROBLEMS INCLUDED. CUES AND CRITIQUES WILL BE AVAILABLE FROM A SYNTHETIC INSTRUCTOR'S VOICE. IN PHASE I WE WILL ASSEMBLE A TAT DEMONSTRATION UNIT AND DEVELOP SUFFICIENT INTERACTIVE SOFTWARE FOR ITS MICROCOMPUTER CONTROLLED LASERDISC. WE WILL ADAPT A QUANTITY OF GFE FILM FOOTAGE AND IMPRINT IT ON THE LASERDISC FOR CALL-UP BY THE COMPUTER AT THE COMMAND OF EITHER THE STUDENT OR INSTRUCTOR. THE COMPLETE STAND-ALONE SYSTEM (DESIGNED TO COST LESS THAN \$25,000 IN PRODUCTION) WILL BE DELIVERED IN SIX MONTHS TO NTEC FOR CONTINUED USE IN EVALUATION OF ITS APPLICABILITY WHILE ADDITIONAL PRODUCTION PROTOTYPES AND THEIR FULL-UP INTERACTIVE SOFTWARE PROGRAMS ARE BEING PERFECTED

FISCAL YEAR 1986

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DURING PHASE II.

INTERCOMP RT 3 - BOX 212 STILLWATER, OK 74074 JAMES LANGE TITLE: REFLECTIVITY ALGORITHM FOR RAY TRACING ADAPTATION T 148 OFFICE: LABCOM/BRL	ARMY	\$ 48,716
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AN ALGORITHM IS DEVELOPED FOR APPLICATION IN A RAY TRACING PROGRAM TO PROVIDE THE AMPLITUDE, POLARIZATION, AND PHASE OF AN ELECTRO-MAGNETIC WAVE REFLECTED FROM A DIELECTRIC BODY. TWO DIFFERENT CONFIGURATIONS ARE USED. THE FIRST CONSISTS OF AN ABSORPTIVE DIELECTRIC BODY AND THE SECOND OF A DIELECTRIC BODY COATED WITH A ABSORPTIVE LAYER. THE ALGORITHM IS BASED ON AN EXACT SOLUTION TO THE BOUNDARY VALUE PROBLEM DEFINED BY THE CONTINUITY OF COMPONENTS OF THE ELECTRIC AND MAGNETIC FIELDS ACROSS THE BOUNDARY. THE REFLECTIVITY FROM THE ABSORPTIVE COATING IS CALCULATED USING FINITE VECTOR SUM DEVELOPMENT OF THE MULTIPLY REFLECTED ENERGY IN THE ABSORPTIVE LAYER. EXAMPLES OF THE DISPERSIVE EFFECTS OF THE ABSORPTIVE LAYER ARE MODELED FOR SOME REPRESENTATIVE INPUT SIGNAL IMPULSES. DETAILED EXAMPLES OF VARIOUS ALTERATIONS IN THE REFLECTED SIGNAL PARAMETERS DUE TO THE NATURE OF THE SURFACE WILL BE ILLUSTRATED IN THE FINAL REPORT.

INTERCOMP RT 3 - BOX 212 STILLWATER, OK 74074 JAMES N LANGE TITLE: ACOUSTIC TRANSMISSION THROUGH A ROUGH SURFACE T 132 OFFICE: LABCOM/MTL	ARMY	\$ 48,716
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SURFACE ROUGHNESS AFFECTS BOTH THE SHAPE OF AN ULTRASONIC IMPULSE TRANSMITTED THROUGH AN INTERFACE AND ITS POWER SPECTRUM. TO FULLY APPLY ADVANCED SIGNAL ANALYSIS TECHNIQUES TO DETERMINING QUANTITATIVE INFORMATION ABOUT DEFECTS AND IMPERFECTIONS IT IS NECESSARY TO COMPENSATE FOR THE FREQUENCY DEPENDENT EFFECTS INTRODUCED BY SURFACE ROUGHNESS. THIS PROJECT PROPOSES TO MODEL SURFACE ROUGHNESS TO

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----AWARDED  
AMOUNT  
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OBTAIN A MEANS OF NUMERICALLY EVALUATING ITS EFFECT ON BOTH THE POWER SPECTRUM OF A TRANSMITTED IMPULSE AND THE TEMPORAL TRANSMITTED SIGNAL. THE ROUGHNESS IS SCALED RELATIVE TO AN ACOUSTIC WAVELENGTH AND IS DIVIDED INTO FINE GRAINED AND LARGE SCALE IRREGULARITIES. THE FINE GRAINED ROUGHNESS IS MODELED BY AN INTERVENING LAYER WITH EFFECTIVE PHYSICAL PROPERTIES. THE SOLUTION TO THE MODEL ROUGHNESS CONFIGURATION PROVIDES A TRANSFER FUNCTION WHICH YIELDS THE FOURIER SPECTRUM OF THE TRANSMITTED IMPULSE FROM WHICH THE POWER SPECTRUM IS DETERMINED. BY COMPENSATING FOR THE EFFECT OF SURFACE ROUGHNESS, A MORE DETAILED QUANTITATIVE ANALYSIS OF DEFECT STRUCTURE IS POSSIBLE.

INTERNATIONAL INFORMATION SYSTEMS INC

ARMY

\$ 59,114

802 WOODWARD RD

MARSHALL, VA 22115

DR GERALD W HOPPLE

TITLE:

MENTAL MODELS AND KNOWLEDGE REPRESENTATION: NEXT GENERATION

INTELLIGENT SYSTEM DESIGN AND DEVELOPMENT

T 153

OFFICE: LABCOM/BRL

THIS PROJECT WILL DESIGN AND DEVELOP PROTOTYPE COMPUTER-BASED MODEL OF ARMY PLANNING AND DECISION-MAKING WHICH EMPLOYS A MENTAL MODEL AS THE KNOWLEDGE REPRESENTATION SCHEME. MENTAL MODELS AND OTHER RELEVANT COGNITIVE STRUCTURES ARE NATURAL AND BASIC INTERFACES OR TEMPLATES FOR PERCEPTION AND COGNITION. COMPUTER-BASED MENTAL MODELS CAN SERVE AS INTERFACE TOOLS FOR COMPUTER-BASED PROBLEM-SOLVING DESIGNED TO ACHIEVE GENUINE HUMAN-COMPUTER PARTNERSHIPS. THE PROJECT WILL INVOLVE THE CONSTRUCTION OF A TYPOLOGY OF MILITARY PROGRAM-SOLVING COGNITIVE STRUCTURES, THE DESIGN OF A PROTOTYPE "STORYBOARD", THE IMPLEMENTATION OF THE RAPID PROTOTYPING STRATEGY TO SYSTEMS DESIGN AND DEVELOPMENT, AND THE DEVELOPMENT OF A GRAPHIC INTELLIGENT INTERFACE--BASED ON THE MENTAL MODEL--TO INTERACTIVE SYSTEMS USE. IN ADDITION TO THE DELIVERY OF THE STORYBOARD FOR A KNOWLEDGE-BASED SYSTEM IN A PROBLEM DOMAIN RELEVANT TO BRL, THE PROJECT WILL ALSO PRODUCE AN INTEGRATED RESEARCH DESIGN FOR FUTURE INQUIRY INTO METAL MODELS AND KNOWLEDGE REPRESENTATION.

INTERNATIONAL MICRO INDUSTRIES

NAVY

\$ 50,000

23 OLNEY AVE

CHERRY HILL, NJ 08003

THOMAS L ANGELUCCI SR

TITLE:

DIRECT SURFACE MOUNT IC PACKAGE FOR PCB'S

T 149

OFFICE: NWSC

THIS EFFORT WILL FOCUS ON LOWERING COST AND IMPROVING PERFORMANCE BY

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AMOUNT  
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ELIMINATING CERAMIC AND PLASTIC PACKAGES PRESENTLY USED IN SURFACE MOUNTING SEMICONDUCTOR CHIPS. THE CHIP WILL BE MOUNTED DIRECTLY TO A PREPARED FOOTPRINT ON THE PRINTED CIRCUIT BOARD (PCB) UTILIZING ADVANCED TAPE AUTOMATED BONDING (TAB) AND NEW CHIP OVERCOATING MATERIALS. A COMMERCIALY AVAILABLE VLSI CHIP WITH MORE THAN 60 I/O'S WILL BE SELECTED (THE PRIME CANDIDATE IS A CHIP WITH 136 I/O'S) TO BE TAB SURFACE MOUNTED TO PCB'S AND THEN OVERCOATED WITH SPECIALIZED ENCAPSULANTS. PRIOR TO EXCISE AND SURFACE MOUNTING, THE CHIP WILL BE PROCESSED WITH ELECTROPLATED GOLD BUMPS ON EACH CHIP BONDING PAD, THEN INNER LEAD BONDED (ILB) TO A 35MM FILM OF POLYIMIDE MATERIAL TO WHICH COPPER FOIL HAS BEEN LAMINATED, AND THE APPROPRIATE CIRCUIT PATTERN ETCHED AND GOLD PLATED. THE ILB PROCESS IS ACCOMPLISHED WITH GANG BONDING, A SINGLE OPERATION THAT BONDS ALL OF THE CIRCUIT LEADS TO THEIR ASSIGNED BONDING PADS. THE SURFACE MOUNTED AND OVERCOATED CHIP-ON-BOARD WILL BE TESTED AND EVALUATED FOR ENVIRONMENTAL AND MECHANICAL PROTECTION PLUS THERMAL MANAGEMENT.

INTERNATIONAL SYSTEMS SERVICES CORP  
TWO GRAND CENTRAL TOWER  
NEW YORK, NY 10017  
ALLAN I LEVY

NAVY

\$ 46,439

## TITLE:

SIMULATION SOFTWARE: AUTOMATIC PREPARATION OF MODEL INPUT FROM  
FUNCTIONAL DEFINITIONS

T 140

OFFICE: NWSC

COMPONENT DESIGN REQUIRES THE USE OF MODELING TOOLS TO EVALUATE FUNCTIONALITY AND PERFORMANCE DURING DEVELOPMENT. THIS PROJECT WILL EXPLORE THE FEASIBILITY OF AUTOMATICALLY GENERATING INPUT TO PERFORMANCE EVALUATION MODELS OF NEW COMPONENTS FROM THEIR FUNCTIONAL DESCRIPTION, EXPRESSED USING A PROBLEM DEFINITION LANGUAGE. AN APPROPRIATE PROBLEM DEFINITION LANGUAGE WILL BE IDENTIFIED. A SUITABLE COMPONENT WILL BE SELECTED AND A FUNCTIONAL DEFINITION PREPARED. A BASELINE PERFORMANCE MODEL WILL BE PREPARED AND VALIDATED USING TRADITIONAL MODEL-BUILDING TECHNIQUES. THIS WILL SERVE AS A BASELINE. THE PRINCIPLES OF KNOWLEDGE ENGINEERING AND THE FIRM'S MODELING EXPERIENCE WILL BE USED TO PREPARE TRANSFORMATION RULES FOR GENERATING MODEL INPUT BY PARSING THE FUNCTIONAL DEFINITION. IF TECHNICALLY FEASIBLE, A WORKING PROTOTYPE WILL BE PREPARED IN PHASE II.

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INTERNATIONAL TECHNICAL ASSOCS 2281 CALLE DE LUNA SANTA CLARA, CA 95054 JOHN L BOWERS TITLE: VISION CONTROLLED ROBOTIC GRINDING T 303 OFFICE: AFWAL/ML(LN)	AF	\$ 49,910

PROPOSED PROJECT IS TO INCORPORATE ROBOT GRINDING WITH A STATE OF THE ART VISION SYSTEM. GRINDING WOULD BE COMPUTER CONTROLLED BY USING POSITION DATA FROM 3D VISION SYSTEM. VISION SYSTEM WOULD TRANSLATE ON SURFACE OF PROPELLER USING LASER LIGHT SOURCE SCANNING THE SURFACE AND 2D CAMERA WITH INTENSIVITY CENTROID FINDING ANALOG OUTPUT. SURFACE WOULD BE COMPARED WITH CAD DATA BASE FOR PROPELLER TO CONTROL AMOUNT OF MATERIAL BEING REMOVED.

INTERNATIONAL TECHNICAL ASSOCS INC 2281 CALLE DE LUNA SANTA CLARA, CA 95054 RANDAL D ROBINSON TITLE: Nd:YAG LASER CUTTING AND WELDING OF COMBUSTION CHAMBER MATERIALS T 302 OFFICE: AFWAL/ML(LN)	AF	\$ 43,159
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JET ENGINE COMBUSTION CHAMBERS ROUTINELY REQUIRE REPAIR BY REMOVING CRACKED SECTIONS AND WELDING IN NEW ONES. LASER CUTTING AND WELDING MAKE IT POSSIBLE TO PERFORM THESE REPAIRS MUCH FASTER. INTEGRATION OF THE LASER WITH A ROBOT WOULD MAKE IT POSSIBLE TO PERFORM THE REPAIRS SEMI-AUTOMATICALLY. THIS STUDY WILL EVALUATE THE PARAMETERS REQUIRED TO CUT AND WELD WITH A PULSED Nd:YAG LASER THE MATERIALS USED IN PRATT AND WHITNEY TF30 COMBUSTION CHAMBERS. THESE MATERIALS CONSIST OF 0.045 INCH TO 0.090 INCH THICK HASTELLOY-X, HAYNES-188, AND STELLITE-31. THE CUTS AND WELDS PRODUCED WILL BE EVALUATED BY METALLOGRAPHY, MECHANICAL TESTING, MICROHARDNESS TESTING, AND ELEMENTAL MICROANALYSIS. IN ADDITION, THE CUTS AND WELDS WILL BE COMPARED WITH THOSE PRODUCED PREVIOUSLY WITH A CO(2) LASER IN A SEPARATE STUDY. RECOMMENDATIONS WILL BE MADE ON THE SUITABILITY OF USING A PULSED Nd:YAG LASER TO REPAIR JET ENGINE COMBUSTION CHAMBERS.

INTERSCIENCE INC 105 JORDAN RD TROY, NY 12180 JAMES T WOO TITLE: OPTIMIZATION OF AN ALTERNATIVE ELECTROMAGNETIC PROJECTILE ACCELERATOR CONCEPT T 4 OFFICE: DARPA	DARPA	\$ 55,445
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THE DEVELOPMENT OF AN ELECTROMAGNETIC COMPRESSION PROJECTILE

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AWARDED  
AMOUNT

ACCELERATOR THAT CAN MEET THE REQUIREMENTS FOR APPLICATION AS KINETIC ENERGY WEAPON IS PROPOSED. THE PRINCIPAL VIRTUE OF THE PROPOSED CONCEPT, IN ADDITION TO SIMPLICITY AND HIGH EFFICIENCY TYPICAL OF ELECTROMAGNETIC LAUNCHER CONCEPTS PRESENTLY UNDER DEVELOPMENT IS ITS EXPECTED RELIABILITY DUE TO THE FACT THAT, IN CONTRAST TO RAIL GUNS, CURRENT FLOW OCCURS ENTIRELY OUTSIDE OF THE BORE; AND IN CONTRAST TO COAXIAL TYPE OF ELECTROMAGNETIC LAUNCHERS, IT IS CAPABLE OF ACCELERATED TO 20 km/sec IN A DISTANCE OF A FEW METERS. THE PRINCIPAL ELECTROMAGNETIC ELEMENT EMPLOYED IN THE CONCEPT HAS PREVIOUSLY BEEN DEVELOPED FOR OTHER APPLICATIONS AND HAS BEEN SHOWN TO BE CAPABLE OF RELIABLE OPERATIONS. THE OBJECTIVE OF THE PHASE I PROGRAM IS TO FURTHER DEVELOP THE CONCEPT BY MAKING USE OF THE EXISTING DATA BASE ON THE BASIC ELEMENT TO ESTABLISH THE TOTAL FEASIBILITY OF THE PROPOSED CONCEPT AND DETERMINE THE OPTIMUM PERFORMANCE THAT CAN BE REALIZED FROM THESE TYPES OF DEVICES.

INTERTEK  
2655 POINSETTIA DR  
SAN DIEGO, CA 92106  
JOHN B ROES

ARMY

\$ 50,000

## TITLE:

PULSED NUCLEAR REACTOR FUEL TEMPERATURE MEASUREMENT DEVELOPMENT  
T 175 OFFICE: TECOM/WSMR

A RESEARCH PROGRAM IS PROPOSED THAT WILL EXPLORE METHODOLOGIES SUITABLE FOR MEASUREMENT OF TEMPERATURE IN THE CORE OF A PULSED NUCLEAR REACTOR. THE PROGRAM IS PROPOSED BY A PRINCIPAL INVESTIGATOR WHO PREVIOUSLY HAS SUCCESSFULLY DEVELOPED TEMPERATURE MEASUREMENT DEVICES FOR IN-CORE USE. INITIALLY A COMPLETE UNDERSTANDING OF THE PROBLEM WILL BE SOUGHT BY EXAMINING THE DESIGN OF THE PULSED REACTOR IN WHICH THE TEMPERATURE MEASURING DEVICES ARE TO BE USED. SUBSEQUENTLY A NUMBER OF CANDIDATES WILL BE EXAMINED AND EVALUATED FOR SUITABILITY. FINALLY, A PARAMETRIC COMPARISON OF THE CANDIDATES WILL BE PERFORMED WHICH MAY PERMIT THE IDENTIFICATION OF ONE OR MORE MEASUREMENT METHODS THAT HAVE A HIGH PROBABILITY OF SUCCESSFUL DEVELOPMENT INTO A VIABLE SOLUTION. THE RESEARCH PROGRAM WILL RESULT IN A REPORT WHICH SHOWS THE APPROACHES EXAMINED, THE RESULTS FOUND, AND THE CHOICE OR CHOICES RECOMMENDED FOR DEVELOPMENT. THE CHOSEN METHOD WILL BE EXPLORED THROUGH PRELIMINARY DESIGN AS TO FORM A SOUND BASIS FOR THE DEVELOPMENT PHASE.



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INVOTEC 21704 GOLDEN TRIANGLE RD - STE 113 SAUGUS, CA 91350 ROBERT S RITCHIE TITLE: ARMORED VEHICLE CREW RESTING DEVICES - DESIGN AND EVALUATION T 115 OFFICE: TACOM/AMSTA	ARMY	\$ 49,088

A CURRENT NEED EXISTS FOR MEANS ENABLING CREWS OF COMBAT VEHICLES TO FULFILL PHYSIOLOGICAL NEEDS WHILE ENCLOSED WITHIN A VEHICLE FOR PERIODS OF UP TO 72 CONTINUOUS HOURS. HISTORICALLY, SOLDIERS HAVE DISMOUNTED TO FIND A SUITABLE PLACE ON THE GROUND TO ACCOMPLISH THE RESTORATIVE ACTIONS OF EATING, SLEEPING, EXERCISING AND RELIEVING THE STRESS ASSOCIATED WITH AN OPERATIONAL SITUATION. CHEMICAL, BIOLOGICAL AND/OR RADIATION CONTAMINATION PRESENT ON THE BATTLEFIELD CAN MAKE CONTACT WITH THE SURROUNDING ATMOSPHERE HAZARDOUS. RESTING TECHNIQUES ARE INEXTRICABLY TIED TO CREW EFFECTIVENESS AND THUS TO SUCCESS OF THE MILITARY MISSION. RECOGNIZING THE COMPLEXITY OF THE FULL PROBLEM OF LIFE SUPPORT IN CLOSE CONFINEMENT UNDER DANGEROUS CONDITIONS, THIS PROPOSAL OFFERS THREE (3) RELATIVELY SIMPLE, STRAIGHTFORWARD SOLUTIONS TO THE CREW RESTING/RELIEF PROBLEM IN THE FORM OF PERSONAL AND CREW-SHARED APPLIANCES DESIGNED TO FACILITATE THEIR INDIVIDUAL AND COMBINED COMFORT UNDER WHAT ARE EXTREMELY DIFFICULT PERSONAL CONDITIONS.

IONWERKS 2215 ADDISON HOUSTON, TX 77030 J ALBERT SCHULTZ TITLE: DIRECT RECOIL SPECTROSCOPIC MEASUREMENT OF DOPANT AND IMPURITY CONCENTRATIONS ON GaAs(100) T 11 OFFICE: DARPA	DARPA	\$ 50,000
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DETERMINATION OF THE SURFACE STOICHIOMETRY OF SEMICONDUCTOR SURFACES DURING PROCESSING BY MBE OR CVD IS DESIREABLE. DIRECT RECOIL SPECTROSCOPY (DRS) MAY OVERCOME THE LIMITATIONS INHERENT IN CONVENTIONAL SURFACE ANALYSIS SO THAT ANALYSIS OF GaAs SURFACES SIMULTANEOUSLY FOR H, C, O, N, Al, Si, Fe, Zn, Ga, AND As WILL BE POSSIBLE ON SUBSECOND TIME SCALES AT MODERATE PRESSURE (10(-2) TORR). AZIMUTHAL SCANS OF THE SINGLE CRYSTAL SUBSTRATE COUPLED WITH BLOCKING

FISCAL YEAR 1986

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AND SHADOWING ANALYSIS WILL PROVIDE DOPANT AND IMPURITY SURFACE POSITION. DRS WILL BE USED AS A REAL TIME MONITOR OF Al DEPOSITION ON GaAs.

IOWA LASER TECHNOLOGY INC 6122 NORDIC DR CEDAR FALLS, IA 50613 MARK W BALDWIN TITLE: LASER CLADDING OF THERMAL BARRIER COATINGS T 117 OFFICE: NSWC	NAVY	\$ 49,075
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HIGH TEMPERATURE, PROTECTIVE COATINGS ARE CURRENTLY APPLIED BY SEVERAL PROCESSES INCLUDING ELECTRON BEAM EVAPORATION, PACK CEMENTATION, CHEMICAL VAPOR DEPOSITION, SPUTTERING, AND PLASMA SPRAYING. LASER CLADDING IS A FAIRLY NEW PROCESS THAT OFFERS THE UNIQUE ADVANTAGES OF CONTROLLED DILUTION, GOOD FUSION BOND, FINE MICROSTRUCTURES, MINIMAL DAMAGE TO THE SUBSTRATE, DEPOSITION OF HIGH MELTING POINT MATERIALS, COATING OF INACCESSIBLE AND LOCALIZED AREAS, AND DEFECT-FREE HOMOGENEOUS STRUCTURES. IN THE PROPOSED INVESTIGATION, TWO CONTINUOUS-WAVE CO(2) GAS LASERS WITH POWER LEVELS 5 kW (MULTI MODE BEAM) AND 1.2 kW (GAUSSIAN BEAM) WILL BE EMPLOYED TO CLAD THERMAL BARRIER COATINGS USING A MELT/PARTICLE INJECTION PROCESS. THE COATING SEQUENCE INVOLVES A BOND-COAT OF NiCrAlY, FOLLOWED BY AN INTERMEDIATE COAT OF Al(2)O(3) AND AN OVERCOAT OF ZrO(2)/Y(2)O(3). THE PURPOSE OF INTERMEDIATE Al(2)O(3) COATING IS TO PREVENT THE OXIDATION OF BOND-COAT DURING ITS HIGH TEMPERATURE USE AND TO ENHANCE THERMAL-BARRIER CHARACTERISTICS. CYCLIC OXIDATION TESTS AT 2000 DEG F WILL BE CONDUCTED TO EVALUATE THE HIGH-TEMPERATURE PERFORMANCE OF CLADDINGS. LIGHT MICROSCOPY, SCANNING ELECTRON MICROSCOPY, MICROPROBE ANALYSIS, AND HARDNESS TESTS WILL BE USED TO CHARACTERIZE THE COATINGS BEFORE AND AFTER HIGH-TEMPERATURE ENVIRONMENTAL EXPOSURE. THE OBJECTIVE OF PHASE I PROGRAM IS TO DETERMINE THE FEASIBILITY OF LASER CLADDING PROCESS FOR OBTAINING DEFECT-FREE, DENSE, UNIFORM, COHERENT, THICK AND HIGH-DEPOSITION RATE CLADDINGS.

ISTAR INC 406 ALTA AVE SANTA MONICA, CA 90402 DONALD H TSAI TITLE: ROLE OF CRYSTALLINE DEFECTS IN THE INITIATION OF DETONATION IN AN ENERGETIC MATERIAL T 8 OFFICE: ARDC/SMCAR	ARMY	\$ 36,097
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WE PROPOSE A DETAILED STUDY OF THE DYNAMICS OF A DETONATION WAVE IN

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AMOUNT

A MODEL OF A DENSE ENERGETIC MATERIAL BY THE METHOD OF MOLECULAR DYNAMICS. OUR PURPOSE IS TO INVESTIGATE THE ROLE OF "HOT SPOTS" IN THE INITIATION OF CHEMICAL REACTIONS AND THE ACCOMPANYING ENERGY TRANSPORT AND ENERGY SHARING PROCESSES IN THE DETONATION WAVE ON A MOLECULAR SCALE. THESE PROBLEMS ARE IMPORTANT TO OUR BASIC UNDERSTANDING OF THE PARAMETERS CONTROLLING THE RATE OF CHEMICAL ENERGY RELEASE AND CONVERSION AND HENCE OF THE EFFECTIVE USE AND SAFE HANDLING OF CHEMICAL EXPLOSIVES. IN PHASE I OF THIS PROPOSAL, OUR OBJECTIVES ARE (1) TO INVESTIGATE THE FEASIBILITY OF USING A MODERN MICROCOMPUTER (E.G., IBM-AT + DSI-32 COPROCESSOR BOARD) FOR DOING LARGE SCALE MOLECULAR DYNAMICS CALCULATIONS AND (2) TO STUDY THE INITIATION OF DETONATION IN A TWO-DIMENSIONAL ENERGETIC CRYSTAL CONTAINING VACANCIES AND MASS DEFECTS AS A SAMPLE OF COMPUTER SIMULATION OF THE DETONATION PROBLEM FROM A MICROSCOPIC VIEWPOINT. SUCCESS IN THESE OBJECTIVES WILL ENABLE US TO PROGRESS TO OTHER PROBLEMS, INCLUDING A SYSTEMATIC COMPARISON OF MOLECULAR DYNAMIC RESULTS WITH HYDRODYNAMIC RESULTS, A MORE REALISTIC CHEMICAL MODEL OF AN ENERGETIC CRYSTAL, AND IN INVESTIGATION OF ENERGY TRANSPORT AND ENERGY RELAXATION IN DENSE MOLECULAR SYSTEMS.

ITASCA CONSULTING GP INC  
PO BOX 14806  
MINNEAPOLIS, MN 55414  
MARK BOARD

AF

\$ 48,145

## TITLE:

DEVELOPMENT OF A MODEL FOR MUCK FLOW PREDICTION FOR DEEP-BASING  
EGRESS

T 241

OFFICE: BMO/MYSC

THE DEEP-BASING CONCEPT REQUIRES THE CAPABILITY FOR FAST EGRESS FROM THE UNDERGROUND FACILITY. THIS EGRESS REQUIRES THE USE OF INCLINED RAISE BORERS, THE UTILITY OF WHICH DEPENDS, TO AN EXTENT, ON THE FLOW OF MUCK IN THE INCLINED RAISE. THREE METHODS FOR DETERMINING THE FLOW PROPERTIES OF MUCK ARE THE EMPIRICAL, THE ANALYTICAL, AND THE NUMERICAL. THE WORK PROPOSED HERE OFFERS A COMBINED EMPIRICAL-NUMERICAL APPROACH. A SERIES OF BENCH-SCALE LABORATORY TESTS ARE DESIGNED TO DETAIL THE FLOW PROPERTIES OF BROKEN ROCK AS A FUNCTION OF THE ROCK TYPE, SIZE GRADATION, WATER CONTENT, AND RAISE CONDITIONS. A MULTI-VARIATE LEAST-SQUARES ANALYSIS WILL PRODUCE AN ANALYTICAL EXPRESSION FOR DETERMINING THE MUCK FLOW PROPERTIES. IN ADDITION, IT IS PROPOSED TO DEMONSTRATE THE ABILITY OF THE DISTINCT ELEMENT METHOD

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TO PREDICT MUCK FLOW. THIS COULD PROVIDE THE CAPABILITY FOR EXTRA-  
POLATION OF FLOW TO NEW MUCK AND RAISE CONDITIONS WITHOUT THE NEED  
TO RESORT TO PARAMETER STUDIES.

J&A ASSOCS INC  
18200 W HIGHWAY 72  
GOLDEN, CO 80401  
BRIAN J LILLIS

AF

\$ 50,000

## TITLE:

NAPHTHENE RICH TURBINE FUELS AS HEAT SINKS FOR HYPERSONIC AIRCRAFT  
EVALUATION

T 185

OFFICE: AFWAL/PO

IN ORDER FOR THE NEXT GENERATION OF STRATEGIC AIRCRAFT TO ACHIEVE  
HYPERSONIC SPEEDS, I.E., SPEEDS ABOVE MARCH 5, AN ADEQUATE ON BOARD  
HEAT SINK MUST BE PROVIDED TO COOL ENGINE AND AIRCRAFT SURFACES.  
THIS PROJECT WILL EVALUATE THE CURRENT AVAILABILITY AND POTENTIAL OF  
NAPHTHENE RICH TURBINE FUELS TO MEET THIS CRITICAL NEED. SUCH FUELS  
ARE PARTICULARLY PROMISING IN THAT THEY CAN UNDERGO CATALYTIC ENDO-  
THERMIC REFORMATION TO AROMATIC AND HYDROGEN. THE POTENTIAL RESOURCE  
WILL BE IDENTIFIED AND QUANTIFIED BY CONTACTING ALL DOMESTIC HIGH  
VOLUME PRODUCERS OF CLEAN NAPHTHENE RICH STREAMS. IN PARTICULAR,  
PETROLEUM REFINERS USING HYDROTREATERS AND HYDROCRACKERS AND CHEMICAL  
FEEDSTOCK MANUFACTURERS WILL BE SOUGHT OUT, AND SAMPLES OF THEIR  
PRODUCT STREAMS PROCURED. A LABORATORY SCALE REACTOR WILL THEN BE  
USED TO CHARACTERIZE AND QUANTIFY THIS REACTION FOR SELECTED CANDI-  
DATE FUELS. ACTUAL, OPERATIONAL HEAT FLUX MEASURED DURING THESE  
TESTS WILL BE COMPARED TO THE EXTENSIVE CHEMICAL SPECIES INFORMATION  
AFFORDED BY GC/MS ANALYSIS OF FEED AND PRODUCT TO DETERMINE THE FUEL  
COMPONENTS MOST EFFECTIVE FOR HEAT SINK APPLICATION. THIS WORK WILL  
THEN PROVIDE A BASIS FOR SELECTING AND USING DOMESTIC HYDROCARBON  
RESOURCES ALREADY IN PLACE IN COMMERCIAL VOLUME FOR ADVANCED AIRCRAFT  
APPLICATION.

JAYCOR  
P.O. BOX 85154  
SAN DIEGO, CA 92138  
ROGER STETTNER, PHD

SDIO

\$ 52,148

## TITLE:

NUCLEAR ENVIRONMENT SIMULATION REQUIREMENTS FOR SDI TECHNOLOGIES

T

7

OFFICE:

THIS PROPOSAL IS TO DEFINE THE NUCLEAR ENVIRONMENT SIMULATION RE-

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<p>QUIREMENTS FOR SELECTED ADVANCED SDI TECHNOLOGIES. THREE STAGES ARE ANTICIPATED FOR THE PHASE I WORK. STAGES 1 AND 2 SELECT SPECIFIC SUBSYSTEMS (A LASER MIRROR FOR EXAMPLE) FOR CONSIDERATION BY ANALYTICALLY ESTIMATING THE EFFECTS OF THE NUCLEAR ENVIRONMENT ON THE SUBSYSTEM. THE NUCLEAR EFFECTS SIMULATION REQUIREMENT WILL BE DEFINED BY MEANS OF A NOVEL APPROACH CALLED THE STRESS PARAMETER METHODOLOGY. IN STAGE 2 EXISTING DNA AND SANDI SIMULATORS WILL BE EVALUATED FOR THEIR APPLICABILITY IN NUCLEAR EFFECTS TESTING OF THE SELECTED SDI SUBSYSTEMS AND RECOMMENDATIONS FOR THE DEVELOPMENT OF FUTURE SIMULATORS WILL BE MADE.</p>		

JAYCOR 205 S WHITING ST ALEXANDRIA, VA 22304 J DAVID CLAIBORNE TITLE: TSARINA TARGET BUILDER - A GRAPHICAL DATA BASE T 286 OFFICE: AMD/RDO	AF	\$ 48,125
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TSAR AND TSARINA ARE COMPLEX COMPUTER MODELS THAT SIMULATE AIR BASE OPERATIONS TO DETERMINE LOGISTICS REQUIREMENTS. THE INPUT DATA SETS REQUIRED TO EXECUTE THE MODELS ARE LARGE, AND THE RESOURCES REQUIRED TO DEVELOP INPUT DATA SETS ARE SUBSTANTIAL. WE PROPOSE TO FACILITATE THE CONSTRUCTION AND MODIFICATION OF THE INPUT DATA SETS BY DEVELOPING A GRAPHICS-ORIENTED DATA BASE SYSTEM THAT WILL ENABLE AN ANALYST TO RAPIDLY DEVELOP AN ACCURATE, CONSISTENT AIR BASE REPRESENTATION THAT CAN BE USED BY TSAR AND TSARINA. WE WILL DEMONSTRATE THE FEASIBILITY OF THIS CONCEPT BY CONSTRUCTING A MICROCOMPUTER-BASED SYSTEM THAT WILL CONSTRUCT AND GRAPHICALLY PORTRAY THE AIR BASE TARGET DATA BASE. THE PROTOTYPE SYSTEM WILL ALLOW THE USER TO INTERACTIVELY BUILD A GRAPHICAL REPRESENTATION OF THE AIR BASE. THE SYSTEM WILL INCLUDE A RELATIONAL DATA BASE THAT CONTAINS THE DESCRIPTIONS OF EACH TARGET DISPLAYED IN THE GRAPHIC REPRESENTATION. THE SYSTEM WILL ALSO INCLUDE A REPORT GENERATOR PROCEDURE THAT WILL PRODUCE A FILE OF THE TARGET TARGET INFORMATION IN THE FORMAT REQUIRED BY TSARINA INPUT SET.

JAYCOR 205 S WHITING ST ALEXANDRIA, VA 22304 MARTIN C NIELSEN TITLE: REAL TIME SOFTWARE REQUIREMENT DEVELOPMENT T 96 OFFICE: NSWC	NAVY	\$ 46,317
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THE EXPANDING AVAILABILITY OF RAW COMPUTING POWER HAS CREATED A

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CONSUMER DEMAND FOR SOFTWARE SOLUTIONS THAT UTILIZE THIS POWER. AS FUNCTIONALITY INCREASES SO DOES THE COMPLEXITY OF THE SYSTEM SPECIFICATION. WE PROPOSE TO GREATLY IMPROVE THE EFFICIENCY WITH WHICH SPECIFICATIONS ARE PREPARED BY MEANS OF A SPECIFICATION DEVELOPMENT SYSTEM. THE SPECIFICATION IS USED BY EVERYONE INVOLVED WITH THE DEVELOPMENT OF A SYSTEM (DESIGNERS, CODERS, TESTERS, MANAGEMENT, TRAINERS). A QUALITY SPECIFICATION LEADS TO A QUALITY PRODUCT. IT COMES AS NO SURPRISE, THEREFORE, THAT ERRORS LEFT UNDETECTED IN THE SPECIFICATION ARE VERY COSTLY. IF ALLOWED TO PROPAGATE TO THE FIELD, THESE ERRORS CAN COST 1000 TIMES AS MUCH TO REPAIR AS IF CORRECTED DURING SPECIFICATION DEVELOPMENT. THIS JUSTIFIES A SIGNIFICANT INVESTMENT IN SPECIFICATION DEVELOPMENT TECHNOLOGY. BY CONSIDERING THE SPECIFICATION AS THE SUM OF ALL KNOWLEDGE OF WHAT THE FINAL PRODUCT SHOULD BE, WE CAN INTEGRATE TOOLS, METHODOLOGIES, AI TECHNIQUES AND MANAGEMENT CONSIDERATIONS INTO A FORMALLY ANALYZABLE SYSTEM. SPECIFICALLY, THE OBJECTIVE IS TO CONSTRUCT A PROTOTYPICAL SYSTEM TO DEMONSTRATE THE FEASIBILITY OF COMBINING THESE RESOURCES. THE SUCCESSFUL APPLICATION OF THESE TECHNOLOGIES CAN BE READILY EXTENDED TO OTHER SOFTWARE DEVELOPMENT ENVIRONMENTS.

JAYCOR AF \$ 52,324  
PO BOX 85154  
SAN DIEGO, CA 92138  
DR TERRY FLANAGAN  
TITLE:  
SMALL HARDENED HIGH PERFORMANCE MISSILE COMPUTER DESIGN  
T 214 OFFICE: BMO/MVSC

VHSIC CONTRACTORS HAVE ADDRESSED THE NUCLEAR HARDENING ISSUE AT THE DEVICE LEVEL. HOWEVER, TO SUCCESSFULLY DESIGN A HIGH PERFORMANCE MISSILE COMPUTER SYSTEM. THE NUCLEAR HARDENING ISSUE MUST ALSO BE ADDRESSED AT THE CIRCUIT/SYSTEM LEVEL. THIS PROPOSAL OUTLINES A PROGRAM TO TAKE A HIGH PERFORMANCE VHSIC TYPE MISSILE COMPUTER, DETERMINE ITS VULNERABILITY TO THE NUCLEAR ENVIRONMENT, IDENTIFY CRITICAL HARDENING ISSUES, AND FORMULATE BOTH DEVICE AND CIRCUIT/SYSTEM LEVEL APPROACHES TO INCREASE ITS PERFORMANCE IN THE NUCLEAR ENVIRONMENT.

JAYCOR AF \$ 55,675  
PO BOX 85154  
SAN DIEGO, CA 92138  
CHARLES CRAIN  
TITLE:  
ICBM ICE/ICA SUPPORT DATA BASE  
T 233 OFFICE: BMO/MVSC

THE GROWNING CONCERN IN CONGRESS AND THE DOD OVER ESCALATING COSTS

FISCAL YEAR 1986

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IN DOD SYSTEMS HAS PROMOTED THE MORE EXTENSIVE USE OF ICES (INDEPENDENT COST ESTIMATES) AND ICAS (INDEPENDENT COST ANALYSES). BMO HAS LONG BEEN THE LEADER IN THE USE OF THESE ESTIMATES FOR ITS PROGRAMS. HOWEVER, IN ORDER TO MORE EFFICIENTLY GATHER THE COST DATA AND PRODUCE IT, A SYSTEM OF RETRIEVAL AND STORAGE IS NEEDED. THIS WOULD ELIMINATE THE NEED TO CONTINUALLY RECALCULATE COSTS AND WOULD MAKE MORE EFFICIENT USEAGE OF THE PROJECT OFFICER'S TIME.

JAYCOR	AF	\$ 60,754
PO BOX 85154 - 11011 TORREYANA RD		
SAN DIEGO, CA 92138		
DR JAMES H -Y YU		
TITLE:		
ICBM DEEP BASING RAPID AUTOMATED COST EFFECTIVE HIGHLY INCLINED		
BLIND RAISE TUNNEL LINING - INSPECTION AND CONTROL		
T 242	OFFICE: BMO/MVSC	

THE BLIND RAISE TUNNEL LINING REQUIRES THAT HIGH SPEED AUTOMATED APPLICATION OF THE LINING MATERIAL BE MADE. AN IMPORTANT ASPECT OF THE TUNNEL LINING PROCESS IS A RELIABLE INSPECTION AND CONTROL SUBSYSTEM THAT WOULD ENSURE THAT THE LINING SATISFY THE CRITERIA ESTABLISHED. IN THIS PROPOSAL, DETAILED DISCUSSIONS OF THE REQUIREMENT FOR SETTING INSPECTION AND CONTROL SUBSYSTEM DESIGN GUIDELINES ARE MADE, PRELIMINARY CONCEPTUAL DESIGN OF AN EXPERT SYSTEM IS PRESENTED, AND THE KEY ISSUES ON THE EVALUATION OF THE SUBSYSTEM IS DESCRIBED.

JAYCOR	AF	\$ 59,035
PO BOX 85154 - 11011 TORREYANA RD		
SAN DIEGO, CA 92138		
DR KIT K KAN		
TITLE:		
STRUCTURAL AND DYNAMIC ANALYSIS SIMULATION FOR ICBM DESIGN		
T 251	OFFICE: BMO/MVSC	

IN THIS PROPOSAL JAYCOR DESCRIBES AN EFFORT TO DEVELOP A FAST RUNNING, SMALL NODE NUMBER COMPUTER CODE FOR THE DESIGN AND MODAL RESPONSE ANALYSES FOR AN ICBM MISSILE IN FLIGHT. THE CODE WILL TAKE INTO ACCOUNT THE HIGH TEMPERATURE AND PRESSURE ENVIRONMENTS EXPECTED WITH HOT MISSILE AND SLOW MISSILE DESIGN CONCEPTS. THE CODE WILL ALSO HAVE THE ABILITY TO PERFORM DYNAMIC LOAD ANALYSES AND TRAJECTORY

FISCAL YEAR 1986

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## ANALYSES.

JAYCOR 1221 LAKE PLAZA DR COLORADO SPRINGS, CO 80906 RANDALL K WHITE TITLE: LOGISTICS SUPPORT OF NUCLEAR SURVIVABLE EQUIPMENT T 91 OFFICE: LABCOM/HDL	ARMY	\$ 49,131
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AN INTEGRATED LOGISTICS SUPPORT CONCEPT NEEDS TO BE DEVELOPED WHICH WILL DESCRIBE HOW NUCLEAR HARDNESS AND SURVIVABILITY INFORMATION CAN BE PROPERLY INCORPORATED INTO THE ILS. THIS PROPOSAL DESCRIBES THE TECHNICAL CONSIDERATIONS REQUIRED TO FORMULATE THIS TYPE OF CONCEPT. IN ADDITION, WE HAVE ADDRESSED RECENT DEVELOPMENTS BY OTHER AGENCIES INVOLVED IN SIMILAR ACTIVITY. INTEGRATION OF HARDNESS INFORMATION INTO SYSTEM ACQUISITION AND ILS PROGRAMS WILL RESULT IN THE MOST COST-EFFECTIVE APPROACH TO LIFE CYCLE SURVIVABILITY. THIS TASK INCLUDES A TECHNICAL REVIEW OF EXISTING ARMY AND DOD SPECIFICATIONS AND STANDARDS IN ORDER TO CLARIFY OR MODIFY SOURCE DOCUMENTS AND DATA ITEM DESCRIPTIONS FOR THE PROPER INCORPORATION OF NH&S INFORMATION AND DATA.

JAYCOR 11011 TORREYANA RD SAN DIEGO, CA 92121 DR RUSSELL H BONN TITLE: SINGLE PULSE HIGH POWER MICROWAVE DIAGNOSTICS T 93 OFFICE: LABCOM/HDL	ARMY	\$ 49,947
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EXPAND THE EXISTING CAPABILITY TO RECORD SINGLE PULSE, HIGH POWER MICROWAVE (HPM) SIGNALS TO 100 GHz. ENSURE THAT SPECTRAL CONTENT, POWER, PULSE WIDTH, MODE AND BANDWIDTH MAY BE DETERMINED.

JAYCOR 11011 TORREYANA RD SAN DIEGO, CA 92121 DR RUSSELL H BONN TITLE: WIDE BAND ELECTROMAGNETIC FIELD SENSORS T 94 OFFICE: LABCOM/HDL	ARMY	\$ 50,131
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DEVELOP, CONSTRUCT, AND TEST ELECTRIC AND MAGNETIC FIELD SENSORS



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WITH A BANDWIDTH 10 KHz TO 1 GHz.

JRS RESEARCH LABS INC  
202 W LINCOLN AVE - #A  
ORANGE, CA 92665  
ROBERT J SHERAGA

AF

\$ 49,392

TITLE:

AUTOMATIC DERIVATION OF PERFORMANCE CONSTRAINTS AND GENERATION  
OF DESIGN GUIDELINES

T 122

OFFICE: AFWAL/AA

ONE OF THE MAJOR ISSUES THAT EXISTS IN THE DESIGN PROCESS FOR HIGH PERFORMANCE COMPUTERS IS THAT OF DETERMINING, SPECIFICALLY, THE REASONS WHY A PARTICULAR DESIGN ACHIEVES A PARTICULAR PERFORMANCE MEASURE FOR AN APPLICATION PROBLEM OF INTEREST (E.G., A BENCHMARK). THAT IS, IT IS OF INTEREST TO KNOW WHICH CHARACTERISTICS OF THE DESIGN HAVE CONSTRAINED ITS PERFORMANCE AND WHICH CHARACTERISTICS MAKE IT MORE EFFECTIVE THAN OTHER DESIGNS. IF ONE COULD AUTOMATICALLY DERIVE THIS TYPE OF INFORMATION AND PROVIDE IT TO DESIGNERS EARLY IN THE DESIGN PROCESS, THEN THE OVERALL QUALITY OF DESIGNS SHOULD IMPROVE AND THE PROBABILITY OF MISSION SUCCESS SHOULD INCREASE MEASURABLY. THE PROPOSED APPROACH TO THIS PROBLEM IS TO UTILIZE THE JRS INTEGRATED DESIGN AUTOMATION SYSTEM AS A STARTING POINT AND TO THEN ADD TO IT THE CAPABILITY TO DERIVE THE INFORMATION OF INTEREST. THE PRIMARY EXTENSIONS TO THE SYSTEM WOULD BE IN THE FORM OF COMPREHENSIVE INSTRUMENTATION PACKAGES THAT WOULD BE INTEGRATED WITH THE EXISTING MICROCODE OPTIMIZATION SOFTWARE ELEMENTS. THE INFORMATION OF INTEREST TO A DESIGNER IS OBTAINABLE FROM THESE OPTIMIZATION ELEMENTS IN A FORM THAT CAN BE PROCESSED FOR MEANINGFUL PRESENTATION TO A DESIGNER. ADDITIONAL EXTENSIONS TO THE EXISTING SYSTEM WOULD TAKE THE FORM OF CONTROL ELEMENTS TO RESPOND TO DESIGNERS REQUESTS WHICH RESULT FROM AN EXAMINATION OF THE DATA PRESENTED. THE PHASE I EFFORT WILL FOCUS ON THE SYSTEM DESIGN AND SPECIFICATION ACTIVITIES INVOLVED. A SUITABLE DEMONSTRATION OF THE APPROACH, THE DATA SETS INVOLVED, AND THE EXPECTED USER--SYSTEM INTERACTION WILL BE CONSTRUCTED.

JTP RADIATION INC  
4065 ACHILLES DR  
SALT LAKE CITY, UT 84124  
DEAN S THORNBERT

NAVY

\$ 49,993

TITLE:

TACAN ANTENNA MINIATURE/LIGHT-WEIGHT FOR PATROL HYDROFOIL/OTHER  
SHIPS

T 45

OFFICE: SPAWAR

TO ACHIEVE SATISFACTORY TACAN PERFORMANCE ON ALL RADIALS A SHIP

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>TACAN ANTENNA REQUIRES AN UNOBSTRUCTED SITE, ATOP THE MAIN (HIGHEST) MAST, IN THE CLEAR, FREE OF RF REFLECTIONS. DUE TO THE CONTINUING IMPLEMENTATION OF NEW SYSTEMS E.G. GPS, ECM, JTIDS, OTHER, THE AREA IN THE VICINITY OF THE TOPE OF THE SHIPS MAIN MAST IS CONTINUING TO BE IN GREATER AND GREATER DEMAND. THIS IS ESPECIALLY TRUE IN THE CASE OF AIRCRAFT CARRIERS, BATTLESHIPS AND CGN CLASS CRUISERS. THIS PROPOSAL INTRODUCES A TACAN ANTENNA WHICH COULD BE DEPLOYED AROUND-THE-MAST OF A SHIP IN TWO HALVES, MAKING INSTALLATION OF THE ANTENNA POSSIBLE WITHOUT REMOVING HIGHER EQUIPMENT. SEVERAL OF THE RF AND MECHANICAL ASSEMBLIES PROPOSED FOR THIS ANTENNA INCORPORATE PROVEN STATE-OF-THE-ART TECHNOLOGY.</p>		

KAN KOTE INC PO BOX H PARKER, PA 16049 DANIEL S HAZLETT TITLE: NONSKID COATING AND PROFILE PARAMETERS T 189 OFFICE: NSRDC	NAVY	\$ 49,720
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THE KAN KOTE NONSKID PROCESS USING VINYL ACETATE-ETHYLENE COPOLYMERS (VAE) PERMITS THE INSURANCE OF A HIGH QUALITY, DURABLE YET COST EFFECTIVE COATING. AGGREGATE PARTICLE SIZE AND AMOUNT IN RATIO TO THE VAE WILL PRODUCE A SUPERIOR BONDED, LONG LASTING, WEAR RESISTANCE NONSKID COATING. PHASE I WILL REFINE, TEST, AND ANALYZE NOT ONLY NONSKID COEFFICIENTS BUT ALSO WILL PROVIDE RELEVANT DATA AND EVALUATION OF SEVERAL PROFILE DESIGNS.

KASK LABS 1207 E SECRETARIAT DR TEMPE, AZ 5284 FRED O KASK TITLE: DIGITAL SIMULATION SOFTWARE FOR ALL T 140 OFFICE: NWSC	NAVY	\$ 49,000
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THE QUESTION WHY SIMULATION WILL BE ANSWERED. THE COMPLETE PROCEDURE AND TIME LINES FOR THE DESIGN, ANALYSIS, FABRICATION AND VERIFICATION OF A TYPICAL DIGITAL DESIGN CYCLE WILL BE PRESENTED. A STUDY WILL BE MADE OF PREVIOUS SIMULATION WORK; THE FAILURES OF PRE-

FISCAL YEAR 1986

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VIOUS WORKS; AND WHAT IS REQUIRED FOR FUTURE WORK. THE MODELING OF COMPLEX DIGITAL COMPONENTS. THE REVIEW OF VARIOUS MODELING TECHNIQUES. THE USE OF THESE TECHNIQUES TO BUILD SIMPLE MODELS THAT LEAD TO MUCH MORE COMPLEX MODELS. THE EVALUATION USING COMPUTER PROGRAMS OF DEVICE PARAMETERS. THE DEVELOPMENT OF THESE COMPUTER PROGRAMS. THE REVIEW OF EXISTING SIMULATION ANALYSIS SOFTWARE. THE PROBLEMS WITH EXISTING SOFTWARE. THE DEVELOPMENT OF NEW SOFTWARE TO CORRECT PRESENT LIMITATIONS ON EXISTING SOFTWARE PROGRAMS. AT EVERY STEP OF THE MODELING AND ANALYSIS EFFORT, NOTHING WILL BE COMPLETED WITHOUT THE PROPER VERIFICATION. VERIFICATION IS THE KEY TO A USEFUL SIMULATION. EVERY EFFORT WILL BE MADE FOR THE MAXIMUM USE OF PERSONAL COMPUTERS TO PERFORM THE MODELING AND ANALYSIS TASKS. BY USING PERSONAL COMPUTERS THE TOOLS THAT WILL BE DEVELOPED DURING THIS EFFORT CAN BE USED BY EVERYONE.

KDC/ISI JOINT VENTURE  
400 HESTER ST  
SAN LEANDRO, CA 94577  
DR BRUCE W MAXFIELD

NAVY

\$ 49,998

TITLE:

MICROWAVE MEASUREMENT OF WATER IN FLUIDS  
T 160 OFFICE: NAVAIR/NAEC

THE TECHNICAL OBJECTIVE IS TO DEMONSTRATE THE FEASIBILITY OF USING MICROWAVE OPEN-ENDED RESONATORS FOR QUANTIFYING THE AMOUNT OF MOISTURE IN LIQUIDS IN-SITU, PARTICULARLY HYDRAULIC FLUIDS. SPECIFICALLY, WE SEEK TO DEMONSTRATE THE METHOD'S CAPABILITIES TO MEASURE MOISTURE CONTENT DOWN TO A LEVEL OF 100 PARTS/MILLION OR BETTER. THE RESEARCH WILL FOCUS ON QUESTIONS CONCERNING THE DESIGN AND USE OF COMPACT, NONOBSTRUCTIVE RESONATORS WHICH CAN BE PORTABLE OR PERMANENTLY MOUNTED IN STREAM LINES. MAJOR ATTENTION WILL BE GIVEN TO DETERMINE FACTORS WHICH MAY EFFECT THE CALIBRATION OF THE RESONATORS, AND ON PRACTICAL METHODS OF COMPENSATING FOR SUCH FACTORS.

KESTREL DEVELOPMENT CORP  
1801 PAGE MILL RD  
PALO ALTO, CA 94304  
DOUGLAS R SMITH

NAVY

\$ 49,973

TITLE:

KNOWLEDGE-BASED APPROACHES TO APPLICATION-SPECIFIC SOFTWARE  
SYNTHESIS

T 179

OFFICE: NAVSEA/NOSC

THIS PROJECT WILL PERFORM RESEARCH IN THE AREA OF APPLICATION-

FISCAL YEAR 1986

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SPECIFIC SOFTWARE SYNTHESIS. ITS SCIENTIFIC CONTRIBUTION WILL BE DEEPER UNDERSTANDING OF HOW TO CODIFY AND USE APPLICATION KNOWLEDGE FOR AUTOMATED SYNTHESIS, AND A SPECIFIC PLAN FOR PROTOTYPE DEVELOPMENT AND TESTING ON BOTH EXTERNAL AND INTERNAL (SOFTWARE DEVELOPMENT) APPLICATIONS. PROJECT FOCUS WILL BE DESIGN OF A FACET (APPLICATION SPECIFIC INTERFACE SYNTHESIZER) THAT SYNTHESIZES EFFICIENT USER INTERFACE FROM DIALOG SPECIFICATIONS GENERATED BY "ABSTRACT" APPLICATION-SOFTWARE SYNTHESIZER. ASIS WILL USE PRESENTATION KNOWLEDGE AND USAGE CHARACTERISTICS FROM EACH APPLICATION KNOWLEDGE PACK (CUSTOMIZABLE) HUMAN FACTORS CONSTRAINTS, AND ALGORITHM DESIGN KNOWLEDGE TO SYNTHESIZE EFFECTIVE USER INTERFACES. WE ILLUSTRATE WITH A GRAPH-LAYOUT PROBLEM IN WHICH ASIS DERIVES FROM ITS INPUTS THE SPECIFICATION FOR A SHORTEST-PATH FUNCTION TO BE APPLIED REPEATEDLY AT DIFFERENT VERTICES; GENERAL ALGORITHM-DESIGN KNOWLEDGE THEN DIRECTS THE SYNTHESIS OF AN ALL-PAIRS SHORTEST-PATHS ALGORITHM. A PRODUCTION-QUALITY ASIS WOULD FACTOR OUT A CRITICAL COMPONENT OF THE APPLICATION SOFTWARE SYNTHESIS PROBLEM, LARGELY ELIMINATING THE MANUAL APPLICATION-SPECIFIC INTERFACE DEVELOPMENT AND MAINTENANCE THAT ACCOUNTS FOR AS MUCH HALF OF THE SOFTWARE LIFE-CYCLE COST.

KESTREL DEVELOPMENT CORP	NAVY	\$ 49,988
1801 PAGE MILL RD		
PALO ALTO, CA 94304		
WOLFGANG POLAK		
TITLE:		
FLEXIBLE KNOWLEDGE-BASED SOFTWARE ENGINEERING ENVIRONMENTS		
T 180	OFFICE: NAV/SEA/NOSC	

A TECHNIQUE FOR THE RAPID GENERATION OF SPECIALIZED SOFTWARE ENGINEERING ENVIRONMENTS WILL BE DEVELOPED. THIS EFFORT RELIES ON KNOWLEDGE-BASED PROGRAM TRANSFORMATION TECHNOLOGY DEVELOPED AT KESTREL INSTITUTE PROGRAMMING ENVIRONMENTS BASED ON THIS TECHNOLOGY CONSIST OF AN ENVIRONMENT CORE AND A KNOWLEDGE BASE. KNOWLEDGE OF ALL FACETS OF SOFTWARE DEVELOPMENT IS CAPTURED IN THE KNOWLEDGE BASE. THUS THESE ENVIRONMENTS CAN BE MODIFIED AND CONFIGURED BY ALTERING THE CONTENTS OF THE KNOWLEDGE BASE. FOUNDATIONS AND BASIC TECHNIQUES REQUIRED FOR THE STRUCTURING OF KNOWLEDGE INTO REUSABLE KNOWLEDGE PACKS WILL BE DEVELOPED. TOOLS WILL BE DESIGNED TO DEFINE NEW KNOWLEDGE PACKS, TO DETERMINE DEPENDENCY RELATIONS BETWEEN THEM, AND TO CONSISTENTLY COMBINE SEVERAL KNOWLEDGE PACKS. SPECIAL PURPOSE ENVIRONMENTS CAN BE GENERATED FROM AN ENVIRONMENT CORE BY COMBINING SUIT-

FISCAL YEAR 1986

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ABLE KNOWLEDGE PACKS INTO A KNOWLEDGE BASE. THE DEVELOPED TECHNIQUES ARE GENERAL AND INDEPENDENT OF THE KIND OF PROGRAMMING KNOWLEDGE REPRESENTED. SPECIALIZED ENVIRONMENTS MAY BE OBTAINED FOR SPECIFIC APPLICATION AREAS, FOR NEW TARGET LANGUAGES AND ARCHITECTURES, FOR SPECIALIZED RELEASE PROCEDURES AND QUALITY ASSURANCE RULES ETC.

KILKEARY SCOTT & ASSOCS INC  
2009 N 14TH ST - STE 408  
ARLINGTON, VA 22201  
DR CHARLE S FREER

NAVY

\$ 76,152

TITLE:

ENHANCE CV/CVN FIXED WING AIRCRAFT CENTERLINE APPROACH  
T 162 OFFICE: NAVAIR/NAEC

THE CONCEPTS PUT FORWARD IN THIS PROPOSAL PROVIDE FOR IMPROVED LINE-UP ACCURACY VIA POSITIVE QUEUES AT GREATER DISTANCES (2nm) THAN PRESENTLY PROVIDED FOR CVN'S BY THE PRESENT SYSTEM. ALSO PRESENTED ARE CONCEPTS THAT WILL PROVIDE DISCORNABLE GLIDE PATH INFORMATION MORE POSITIVE IN QUEUE CHARACTERISTICS AND AT GREATER DISTANCES (2nm) THAN THAT PRESENTLY PROVIDED BY FLOLS. THE PROPOSED IMPROVEMENTS ARE BASED ON THE PRINCIPLES, COMPONENTS, AND USE OF EXISTING COMMERCIALY AVAILABLE PAPI SYSTEMS AND COMPONENTS. PHASE I ADDRESSES CONCEPT ANALYSES AND PRELIMINARY LAND BASED TESTING USING THE CANDIDATE PROPOSED DESIGNS. SMALL FIXED WING AIRCRAFT AND HELICOPTERS WILL BE UTILIZED AT A PRIVATE AIRPORT INSTALLATION, OR AN APPROPRIATE FIELD INSTALLATION WITH TEMPORARY LIGHTING SIMULATING THE BASIC CHARACTERISTICS OF THE VISUAL LANDING AIDS PROPOSED. PHASE II PLANS WILL BE ADDRESSED DURING PHASE I AND WILL LEAD TO MORE EXTENSIVE LANDING BASED TESTING, FIXTURE EVALUATION, SHIPBOARD INSTALLATION EVALUATION REQUIREMENT DURING THE PHASE II EFFORT FOR THE MOST VIABLE OF THE CONCEPTS EVALUATED IN PHASE I. THIS WILL CULMINATE IN A PROPOSED FLEET INSTALLATION PLAN WITH ESTIMATED COSTS, SCHEDULES, AND COST BENEFITS TO AID THE NAVY IN DEPLOYMENT DECISIONS.

KLD ASSOCS INC  
300 BROADWAY  
HUNTINGTON STA, NY 11746  
DR DAVID S MAHLER

ARMY

\$ 49,800

TITLE:

HIGH PRESSURE EQUIPMENT FOR OPTICAL LIQUID PROPELLANT STUDIES  
T 144 OFFICE: LABCOM/BRL

AN APPROACH TO THE DESIGN, DEVELOPMENT AND FABRICATION OF A HIGH

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AMOUNT

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PRESSURE MICROSCOPE STAGE WITH FACILITIES FOR A TEMPERATURE RANGE OF MINUS 60 DEGREE CENTIGRADE TO PLUS 60 DEGREE CENTIGRADE IS DESCRIBED. THIS DESIGN IS EXPECTED TO ACHIEVE A MAXIMUM PRESSURE OF 20,000 PSI AND REQUIRE A SAMPLE VOLUME OF LESS THAN 100 ULITER. THE USEFUL OPTICAL SPECTRAL RANGE WILL COVER THE VISIBLE TO NEAR INFRARED. THE PURPOSE OF SUCH EQUIPMENT IS TO ACQUIRE THE PRESSURE-TEMPERATURE DEPENDENCE OF LIQUID:LIQUID AND LIQUID"SOLID PHASE TRANSITIONS. THE SYSTEM TO BE FABRICATED WILL BE USED TO ACQUIRE PRELIMINARY P-T PHASE DAT FOR MATERIALS TO BE SELECTED.

KLEIN ASSOCIATES INC

DARPA

\$ 55,070

PO BOX 264

YELLOW SPRINGS, OH 45387

GARY A KLEIN

TITLE:

ARTIFICIAL INTELLIGENCE QUOTIENT (AIQ)

T 16

OFFICE: DARPA

THIS PROJECT IS INTENDED TO IDENTIFY MEANS OF EVALUATING ARTIFICIAL INTELLIGENCE SYSTEMS BY CONTRASTING THEIR ACTUAL LEVEL OF PERFORMANCE TO THE LEVEL THAT WOULD HAVE BEEN EXPECTED FOR THEM. IN SOME WAYS, THE CONCEPT IS RELATED TO THE INTELLIGENCE QUOTIENT, WHICH IS A RATIO OF MENTAL AGE TO CHRONOLOGICAL AGE, A COMPARISON OF THE PERFORMANCE NORMS TO THE INDIVIDUAL PERFORMANCE LEVEL. FOLLOWING THIS CONCEPT, THE AIQ WOULD COMPARE THE PERFORMANCE OF AN AI SYSTEM WITH PERFORMANCE NORMS. THE CRITICAL TASKS ARE TO SELECT A RANGE OF PERFORMANCE EVALUATION TESTS AND TO DEVELOP A MEANS OF GENERATING NORMS FOR A SPECIFIC AI SYSTEM. THE APPROACH SELECTED WILL RELY ON COMPARISON-BASED PREDICTION METHODS TO ESTABLISH THE PERFORMANCE NORMS AND WILL SELECT TASK ANALYTIC PROCEDURES FOR SYNTHESIZING A PERFORMANCE EVALUATION TEST BATTERY FOR ANY SPECIFIC AI DOMAIN. SUCCESSFUL DEMONSTRATION OF THE FEASIBILITY OF THESE METHODS WILL LEAD TO A PHASE II DEVELOPMENT OF A GENERALIZED PERFORMANCE TEST BATTERY, GENERALIZED PERFORMANCE NORMS, AND THE ESTABLISHMENT OF A DATA BASE TO UPDATE PERFORMANCE NORMS TO REFLECT TECHNOLOGICAL PROGRESS. THE PRODUCTS OF THIS RESEARCH WOULD BE THE GENERATION OF AN AIQ METHODOLOGY AND THE COLLECTION OF DATA TO MAKE THE METHODOLOGY WORK.

KLEIN ASSOCS INC

AF

\$ 53,997

PO BOX 264

YELLOW SPRINGS, OH 45387

GARY A KLEIN

TITLE:

METAPHOR-CASTING OF INFORMATION DISPLAY REQUIREMENTS

T 277

OFFICE: AMD/RDO

THE RAPID EMERGENCE OF NEW PILOT FUNCTIONS AND NEW COCKPIT DISPLAY

FISCAL YEAR 1986

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TECHNOLOGY HAS CREATED A BURDEN FOR DISPLAY DESIGNERS. PREVIOUSLY, ADVANCES WERE SLOW AND EVOLUTIONARY, AND THERE WAS TIME TO DEVELOP AND EVALUATE NEW DISPLAY FORMATS. NOW, PROGRESS IS FASTER AND REVOLUTIONARY, SO THERE IS LESS GUIDANCE FOR COCKPIT DISPLAY FORMATS EVEN WHILE COSTS ARE GREATER AND DECISIONS MORE CRITICAL. THERE IS A NEED TO DEVELOP GUIDELINES FOR DISPLAY DECISIONS. THIS PROPOSED RESEARCH EFFORT FOCUSES ON THE PRINCIPLE THAT DISPLAYS ARE METAPHORS. DISPLAYS REPRESENT AND STRUCTURE CERTAIN TYPES OF INFORMATION THROUGH THE USE OF METAPHORIC SYMBOLS AND RELATIONSHIPS. THEREFORE, BY STUDYING THE ROOT METAPHORS UNDERLYING EXISTING DISPLAY FORMATS, AND MATCHING THESE WITH THE METAPHORIC CHARACTERISTICS OF TASK FUNCTIONS, WE WILL BE ABLE TO GENERATE A SET OF METAPHOR-BASED DISPLAY DESIGN GUIDELINES. THE RESEARCH WILL EMPLOY CRITICAL DECISION METHODS FOR STUDYING DISPLAY DESIGNS, AND WILL ANALYZE THE BASIC METAPHORS INHERENT IN DISPLAY FORMATS THAT ARE JUDGED EFFECTIVE AND INEFFECTIVE. THESE ANALYSES WILL BE USED TO GENERATE A SET OF DESIGN GUIDELINES. THESE GUIDELINES WILL BE DEMONSTRATED IN A TRIAL APPLICATION, AND EVALUATE FOR POTENTIAL VALUE IN THE DESIGN PROCESS.

KMS FUSION INC	NAVY	\$ 49,944
PO BOX 1567		
ANN ARBOR, MI 48106		
C J HAILEY / H K LINTZ		
TITLE:		
A NOVEL X-RAY CONVERTER FOR USE IN NON-DESTRUCTIVE EVALUATION ANALYSES		
T 127	OFFICE: NWC/SSPO	

WE PROPOSE TO INVESTIGATE A NOVEL CONCPET FOR A FLUOROGRAPHIC CONVERTER FOR USE IN REAL TIME RADIOGRAPHY IN THE 50 keV ENERGY RANGE. THE FIBER OPTIC X-RAY SCINTILLATOR (FOXs) IS BASED ON THE INCORPORATION OF A HIGH EFFICIENCY SCINTILLATOR WITH FIBER OPTICS. LIGHT CAN BE COUPLED OUT OF THE FOXs WITH EXTREMELY HIGH EFFICIENCY AND WITH LIGHT CLOUD SPREAD AN ORDER OF MAGNITUDE SMALLER THAN WITH CONVENTIONAL SCREENS. MONTE-CARLO SIMULATIONS INDICATE FOXs WILL HAVE SPATIAL RESOLUTION, BRIGHTNESS, EFFICIENCY AND CONTRAST SUPERIOR TO THAT OBTAINED WITH CONVENTIONAL X-RAY SCREENS. WE WILL INVESTIGATE PROBLEM AREAS AND TECHNIQUES ASSOCIATED WITH FABRICATION OF THE FOXs. SMALL SCALE LABORATORY TESTS WILL BE CONDUCTED TO ASSIST IN DETERMINING A POTENTIAL FABRICATION PROCEDURE.

FISCAL YEAR 1986

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KMS FUSION, INC. 3621 SOUTH STATE RD., P.O. BOX 1567 ANN ARBOR, MI 48106 GEORGE E. BUSCH, PHD TITLE: RED FOX: A CHEMICAL LASER, BASED ON THE RED ELECTRIC DIPOLE FORBIDDEN OXYGEN TRANSITION AT 0.76 UM T 1 OFFICE:	SDIO	\$ 99,925

Y NEW CHEMICAL LASER EMITTING AT 0.76 MICROMETERS IS PROPOSED, BASED ON THE RED ELECTRIC DIPOLE FORBIDDEN OXYGEN (RED FOX) TRANSITION IS PRODUCED BY AN ENERGY-POOLING REACTION. THE HIGHLY METASTABLE STATE IS THE DIRECT PRODUCT FROM A CHEMICAL REACTION AND IS THE SOURCE OF ELECTRONIC ENERGY IN THE EXISTING CHEMICAL OXYGEN-IODINE LASER (COIL), IN WHICH THE EXCITATION IS TRANSFERRED TO ATOMIC IODINE, THE LATTER OF WHICH LASES AT 1.3 MICROMETERS. THE RED FOX LASER BENEFITS FROM THE COIL'S ESTABLISHED SUCCESS IN PRODUCING AND UTILIZING HIGH YIELDS. COMPARABLE ENERGY STORAGE DENSITIES TO THOSE IN THE COIL ARE AVAILABLE IN THE RED FOX LASER, AND THEORETICAL ENERGY UTILIZATION EFFICIENCIES CAN APPROACH 40%. AN EXPERIMENTAL RESEARCH PROGRAM TO EVALUATE THE FEASIBILITY OF THE RED FOX LASER IS PROPOSED.

KOFORD ENGINEERING 234 LALONDE AVE ADDISON, IL 60101 STUART KOFORD TITLE: IMPROVED CONNECTORS AND CABLE FOR RAPID DEPLOYMENT BATTLEFIELD POWER SYSTEMS T 98 OFFICE: BRDC	ARMY	\$ 44,980
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THE DEVELOPMENT OF A NEW GENERATION OF DURABLE, EASY TO USE POWER CONNECTORS FOR BATTLEFIELD USE IS PROPOSED. THE DESIGN OF THIS PRODUCT WILL TAKE ADVANTAGE OF THE DEVELOPMENT OF HIGH PERFORMANCE REINFORCED POLYMERS TO PROVIDE NON DENTING, AND NON CORRODING, HOUSINGS. RETENTION MECHANISMS WHICH ARE EASIER TO USE, AND MORE DURABLE THAN THREAD OR BAYONETTE DESIGNS WILL BE PART OF THE OBJECTIVE. CONTACT DESIGN WILL BE DIRECTED TO INCREASING DURABILITY AND DEVELOPING SELF CLEANING, NON JAMMING DESIGNS. ALTERNATIVES TO SILVER PLATING WHICH OFFER BETTER RESISTANCE TO AIRBORNE SULFUR COMPOUNDS BUT WHICH ARE NOT PROHIBITIVE IN COST WILL BE INVESTIGATED.



FISCAL YEAR 1986

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CABLE FORM FACTORS WHICH ARE ALTERNATIVES TO ROUND CABLE WILL BE EVALUATED, ESPECIALLY IN REGARDS TO THE USE OF FLAT CABLE IN REEL TYPE DISPENSERS, FOR EASE OF USE.

KOFORD ENGINEERING 234 LALONDE AVE ADDISON, IL 60101 STUART KOFORD TITLE: IMPROVED MOISTURE RESISTANT POTTING MATERIALS/TECHNIQUES FOR IMAGE INTENSIFIERS T 64 OFFICE: CECOM/AMSEL	ARMY	\$ 42,765
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THE PRESENT POTTING MATERIAL IN USE ON IMAGE INTENSIFIER TUBES, RTV-11 ALLOWS MOISTURE PENETRATION TO THE SURFACE OF THE TUBE ALLOWING EXCESSIVE LEAKAGE DURING HIGH HUMIDITY CONDITIONS. A TWO STAGE APPROACH IS PROPOSED INVOLVING THE APPLICATION OF A HIGH RESISTANCE, HYDROPHOBIC COATING TO THE SURFACE OF THE COMPONENTS. THE MODULE WILL THEN BE POTTED WITH A LOW MOISTURE ABSORPTION, HIGH INSULATION, LOW STRESS POTTING COMPOUNDS. COMMERCIAL MATERIALS WILL BE INVESTIGATED AS WELL AS ONE ESPECIALLY FORMULATED FOR THIS APPLICATION.

KTECH CORP 901 PENNSYLVANIA NE ALBUQUERQUE, NM 87110 A J SMITH TITLE: FEASIBILITY OF A HIGH TOTAL DOSE GAMMA SIMULATOR FOR TREE VULNERABILITY AND SURVIVABILITY STUDIES T 2 OFFICE: DDST	DNA	\$ 46,970
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NO ABSTRACT AT THIS TIME

KTECH CORP 901 PENNSYLVANIA AVE NE ALBUQUERQUE, NM 87110 DONALD V KELLER TITLE: ENHANCEMENT OF PULSED RADIATION SOURCES (PRS) SIMULATION TESTING CAPABILITY AND DEBRIS ELIMINATION T 2 OFFICE: AM/SBIR	DNA	\$ 47,958
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PULSED RADIATION SOURCES (PRS) SUCH AS BLACKJACK 5 AND DOUBLE EAGLE

FISCAL YEAR 1986

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<p>CAN PRODUCE COPIOUS LINE X-RAY OUTPUTS IN THE FEW KEV RANGE. THESE X-RAYS ARE USED TO IRRADIATE SAMPLES AND IT IS DESIRABLE TO USE AS MUCH OF THE X-RAY FLUX AS POSSIBLE. THE SAMPLE IRRADIATIONS, HOWEVER, ARE ACCOMPANIED BY UNWANTED BACKGROUND EFFECTS CAUSED BY BOTH LOW ENERGY BLACKBODY RADIATION AND DEBRIS. FILTERING OUT THESE EFFECTS TYPICALLY REDUCES THE FLUENCE ON TARGET BY AS MUCH AS AN ORDER OF MAGNITUDE. THIS PROPOSAL SUGGESTS A NOVEL AND INEXPENSIVE WAY OF ELIMINATING THESE PROBLEMS, AT NO SACRIFICE IN FLUENCE ON THE TARGET. THERE IS EVEN THE POSSIBILITY OF INCREASING THE INTENSITY ON TARGET. THE PROPOSED IDEA HAS PROVEN ITSELF FOR OTHER APPLICATIONS INVOLVING X-RAYS IN THE 2 TO 7 KEV RANGE.</p>		

KVH INDUSTRIES INC 850 AQUIDNECK AVE - STE C MIDDLETOWN, RI 02840 A H KITS VAN HEYNINGEN TITLE: MINIATURE ORTHOGONAL MAGNETIC SENSOR T 51 OFFICE: NAVSEA	NAVY	\$ 49,923
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KVH INDUSTRIES PROPOSES TO DEMONSTRATE THE FEASIBILITY OF DEVELOPING A MINIATURIZED ORTHOGONAL MAGNETIC SENSOR ASSEMBLY WHOSE VOLUMETRIC DIMENSION, INCLUDING SHIELD, WILL NOT EXCEED 10 cm(3). THE UNIT HAS AS OBJECTIVES A SENSITIVITY OF 1 NANOTESLA WHILE OPERATING AT FLUX DENSITIES OF UP TO 20 OERSTED. FURTHERMORE, THE SYSTEM DRIFT AT ROOM TEMPERATURE IS NOT TO EXCEED 1 NANOTESLA WITHIN A 60 MINUTE PERIOD. THE PROPOSED APPROACH TRANSFORMS THE PROBLEM OF DETECTING AN AMPLITUDE NULL INTO DETECTING A PHASE TRANSITION THROUGH THE USE OF A VERY HIGH GAIN AC AMPLIFIER WITH A LINEAR LIMITER AND A BANDPASS FILTER. THE EFFORT WILL DESIGN A SYNCHRONOUS PHASE DETECTOR WITH MINIMUM OFF-SET AND SWITCHING NOISE THAT HAS A STABLE LOW PASS FILTER WITH MINIMUM RIPPLE IN THE PASS BAND AND A STOP BAND ATTENUATION OF AT LEAST 40 db BELOW MINIMUM SIGNAL. THE ENTIRE MEASUREMENT SYSTEM WILL BE IN THE FEEDBACK LOOP. BIAS CURRENT WILL BE GENERATED TO INCREASE RESOLUTION AND STABILITY. ELECTRONIC CONTROL WILL BE VIA A MICROPROCESSOR WITH DATA OUTPUT AS A THREE BYTE WORD. A PROOF-OF-PRINCIPLE MODEL WILL BE DELIVERED.

KWL ASSOCS INC 4942 HIDDEN SPRINGS BLVD ORLANDO, FL 32819 DR KLAUS W LINDENBERG TITLE: DISTRIBUTED SYSTEM ARCHITECTURE FOR REAL TIME COMPUTER SYSTEMS T 105 OFFICE: NSWC	NAVY	\$ 46,130
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DETAILED DESIGN OF A FLEXIBLE MICRO-COMPUTER COMMUNICATION BUS IS

FISCAL YEAR 1986

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PROPOSED. THE ARCHITECTURE IS CLOSELY RELATED TO A DATA FLOW MICRO-PROCESSOR CONFIGURATION AND UTILIZES A DISTRIBUTED COMMON MEMORY APPROACH FOR HIGH SPEED REAL-TIME DATA COMMUNICATION BETWEEN ANY NUMBER OF PROCESSORS. THE SYSTEM IS ESSENTIALLY TRANSPARENT TO INDIVIDUAL PROCESSOR MODULES AND PERMITS THE USE OF AVAILABLE LANGUAGE COMPILERS, OPERATING SYSTEMS AND SOFTWARE UTILITIES. THE PROPOSED DESIGN IS INDEPENDENT OF THE TYPES OF PROCESSORS EMPLOYED IN THE SYSTEM.

L'GARDE INC	AF	\$ 49,528
1555 PLACENTIA AVE		
NEWPORT BEACH, CA 92663		
GILBERT J FRIESE		

## TITLE:

INFLATABLE SOLAR CONCENTRATOR FLIGHT TEST EXPERIMENT  
T 77 OFFICE: AFRPL/TSTR

A FLIGHT EXPERIMENT PLANNING STUDY OF AN INFLATABLE SOLAR CONCENTRATOR IS PROPOSED. A LARGE SOLAR CONCENTRATOR SYSTEM IS INTENDED FOR EVENTUAL APPLICATION AS THE COLLECTOR FOR THE SOLAR ROCKET. THIS STUDY WILL DEFINE THE FLIGHT TEST HARDWARE AND PERFORMANCE REQUIREMENTS OF A SUBSCALE SOLAR CONCENTRATOR SYSTEM (4-METER DIAMETER) THAT WILL PROVE THE FEASIBILITY OF CONSTRUCTING AND DEPLOYING IN SPACE LARGE SYSTEMS (35-METER DIAMETER).

L'GARDE, INC.	SDIO	\$ 62,132
1555 PLACENTIA AVE.		
NEWPORT BEACH, CA 92663		
DAVID CHITTENDEN, PHD		

## TITLE:

HIGH POWER INFLATABLE RADIATOR STUDY  
T 5 OFFICE:

PREVIOUS EFFORTS HAVE IDENTIFIED CONCEPTS FOR INFLATABLE RADIATORS THAT COULD BE DEPLOYED TO HANDLE INTERMITTENT MASSIVE POWER SURGES, TYPICAL OF THE SDIO MISSION. THE ADVANTAGES OF THE INFLATABLE RADIATOR INCLUDE LOW DRAG, OBSERVABILITY, AND VULNERABILITY IN THE PACKAGED STATE; ABILITY TO HANDLE A VAPORIZING COOLANT; LIGHT WEIGHT AND LOW PACKAGED VOLUME RESULTING IN LOW COST; NONCONTAMINATION OF THE SATELLITE ENVIRONMENT. CONCEPTS EXIST ONLY ON PAPER OR SIMPLE

FISCAL YEAR 1986

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BENCH-TYPE MODELS. TO PROVE FEASIBILITY, A LARGE SCALE TEST IN A REALISTIC SPACE ENVIRONMENT IS NEEDED, SINCE SYSTEMS OF THIS TYPE REQUIRED NEW TECHNOLOGY. THE DEVELOPMENT HAS PROGRESSED TO THE POINT WHERE SUCH A TEST CAN BE PLANNED AND CARRIED OUT. THIS PROPOSAL IS TO DEVELOP A COMPREHENSIVE TEST PLAN FOR DEMONSTRATING AN INFLATABLE/RETRACTABLE HIGH-POWER RADIATOR SYSTEM.

L.N.K. CORP INC  
302 NOTLEY CT  
SILVER SPRING, MD 20904  
BARBARA A LAMBIRD

ARMY

\$ 68,700

## TITLE:

A SYSTEM FOR AUTOMATED FEATURE EXTRACTION  
T 188 OFFICE: ETL/COE

THE PROCESS OF EXTRACTION OF INDUSTRIAL TERRAIN FEATURES FROM RADAR IMAGERY IS NOT AUTOMATED. CURRENTLY THIS FEATURE EXTRACTION IS DONE PRIMARILY BY HIGHLY TRAINED PHOTOINTERPRETERS. THIS IS EXPENSIVE AND WITH THE INCREASING AMOUNT OF RADAR IMAGERY, AUTOMATION IS BECOMING IMPORTANT. IN RECENT YEARS A WIDE RANGE OF TOOLS FROM IMAGE PROCESSING AND ARTIFICIAL INTELLIGENCE HAVE EMERGED WHICH CAN BE APPLIED TO THIS PROBLEM. WE PROPOSE THE REFINEMENT AND TESTING OF IMAGE PROCESSING AND ARTIFICIAL INTELLIGENCE TECHNIQUES DEVELOPED BY L.N.K. CORPORATION ON RADAR IMAGERY AND THE DESIGN AND IMPLEMENTATION OF AN AUTOMATIC INDUSTRIAL TERRAIN FEATURE EXTRACTION SYSTEM. IN PHASE I, WE WILL BEGIN THE ALGORITHM REFINEMENT AND TESTING AND DEVELOP THE SYSTEM DESIGN. PHASE II WILL CONSIST OF FURTHER ALGORITHM DEVELOPMENT AND SYSTEM IMPLEMENTATION AND TESTING. THE PROPOSED FEATURE EXTRACTION SYSTEM IS BASED ON L.N.K.'S ARTIFICIAL INTELLIGENCE SEARCH PARADIGM (SSS\*) DEVELOPED FOR PROBLEM SOLVING AND PATTERN ANALYSIS WHICH INVOLVES SIMULTANEOUS SEARCH OF A PROBLEM-MODEL SPACE AND A PROBLEM-DATA SPACE WITH FEEDBACK BETWEEN THE TWO SEARCHES. LNK IS CURRENTLY DEVELOPING A SHIP CLASSIFICATION SYSTEM FOR INVERSE SYNTHETIC APERTURE RADAR (ISAR) USING THIS PARADIGM.

LAGUNA RESEARCH LAB  
3015 RAINBOW GLEN  
FALLBROOK, CA 92028  
HENDRICUS G LOOS

DARPA

\$ 64,295

## TITLE:

ADAPTIVE STOCHASTIC CONTENT-ADDRESSABLE MEMORY  
T 7 OFFICE: DARPA

IT IS PROPOSED TO EXPLORE THE FEASIBILITY OF ADDING ADAPTIVE AND

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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STOCHASTIC FEATURES TO A CONTENT-ADDRESSABLE MEMORY (CAM) IN SUCH A MANNER THAT THE DEVICE BECOMES CAPABLE OF LEARNING FROM INSTRUCTION AND EXPERIENCE. THE ALGORITHM OF THE ADAPTIVE STOCHASTIC CONTENT-ADDRESSABLE MEMORY (ASCAM) IS THE SAME AS THAT OF ADAPTIVE NEURAL NETWORKS, VIZ., ITERATIVE THRESHOLDED MATRIX-BINARY VECTOR MULTIPLICATION, WITH ADAPTION IN THE FORM OF FACILITATION. THE LATTER COMES IN TWO KINDS: S-FACILITATION, WHICH INVOLVES THE INCREASE OF THE MAGNITUDE OF THOSE MATRIX ELEMENTS WHICH HAVE REPEATEDLY CONTRIBUTED TO OUTPUT IN THE MATRIX-VECTOR MULTIPLICATION IN THE RECENT PAST. T-FACILITATION INVOLVES THE DECREASE OF THRESHOLD OF THOSE COMPONENTS WHICH HAVE REPEATEDLY HAD AN OUTPUT IN THE RECENT PAST. THE CAM STORES A SET OF BINARY WORDS; UPON INPUT OF A WORD WHICH HAS A SMALL HAMMING DISTANCE TO ONE OF THE STORED WORDS, THE CAM OUTPUTS THIS STORED WORD WITHIN A FEW MACHINE CYCLES. AN OPTICAL IMPLEMENTATION OF THE ASCAM IS ENVISIONED. THE FEASIBILITY EXPLORATION WILL BE CONDUCTED THROUGH COMPUTER CALCULATIONS ON A 64-BIT ASCAM. FOR DIFFERENT FACILITATION AND STOCHASTIC SCHEMES, THE LEARNING ABILITY OF THE ASCAM WILL BE INVESTIGATED.

LASER SCIENCE INC	AF	\$ 51,870
80 PROSPECT ST		
CAMBRIDGE, MA 02139		
DR KEITH BOYER		
TITLE:		
THE E-BEAM GUN AND RELEATED COMPOENENT DESIGN FOR PULSED CO2 LASER		
FOR WINDSAT TRANSMITTER		
T 75	OFFICE: AFGL/XOP	

A DESIGN-PHASE PROGRAM IS PROPOSED FOR THE DEVELOPMENT OF THE E-BEAM GUN FOR THE AIR FORCE WINDSAT PULSED CO(2) TRANSMITTER. A TECHNICAL ACCOUNT IS PRESENTED I WHICH IT IS SHOWN THAT THE E-BEAM GUN DESIGN IS INTIMATELY RELATED TO THE PLASMA CHAMBER DESIGN AND THE OTHER CRITICAL COMPONENTS OF THE TRANSMITTER. AS A RESULT OF THIS, THE PROPOSED DESIGN-PHASE WILL COVER AN ITEM-BY-ITEM INSPECTION OF THE ENTIRE TRANSMITTER ALONG THE LINES OUTLINED IN THIS PROPOSAL. WITH RESPECT TO THE FREQUENCY STABILITY REQUIREMENT, THE CAUSES FOR THE INTRAPULSE REFRACTIVE INDEX VARIATION OF THE CO(2) GAIN MEDIUM, WHICH RESULT IN FREQUENCY CHIRP AND INSTABILITIES, ARE QUANTITATIVELY ANALYZED. THE RESULT REVEALS THE POSSIBILITY FOR CONTROLLING THE CHIRP AND MINIMIZING ITS RATE TO A VALUE BELOW THE REQUIRED 200 kHz LIMIT OVER THE 10 MICRO SEC DURATION OF THE LASER PULSE. THE PRO-

FISCAL YEAR 1986

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POSED DESIGN-PHASE WILL FORMULATE A HARDWARE DEVELOPMENT PROGRAM, TO BE IMPLEMENTED IN PHASE II, ADDRESSED TO THE ENGINEERING OF A FLY-ABLE, E-BEAM-SUSTAINED PULSED CO(2) TRANSMITTER. THIS WILL INCLUDE THE DEVELOPMENT OF A DURABLE E-BEAM GUN CATHODE, LONG LIFETIME FOIL, ARCH-PREVENTION DIVERter (CROWBAR) CIRCUIT, PLASMA CHAMBER ENGINEERING, AND OTHER CRITICAL COMPONENTS. THE RELEVANCE OF THIS WORK TO THE DEVELOPING MARKETS FOR ACCURATE DOPPLER-RANGE LASER RADAR IS PRESENTED.

LASER TECHNOLOGIES INC 912 N MAIN ANN ARBOR, MI 48104 J PETER NIEDZIELSKI TITLE: LASER PAINT REMOVAL SYSTEM T 153            OFFICE: AFWAL/ML	AF	\$ 0
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THE OFFEROR, LASER TECHNOLOGIES, INC., HAS A TECHNIQUE AND A WORKING CO(2) LASER BREADBOARD CAPABLE OF REMOVING PAINT FROM SURFACES. IT VAPORIZES POLYURETHANE PAINT FROM SUBSURFACES. THE VAPORIZATION PRODUCTS MUST BE STUDIED FOR ENVIRONMENTAL COMPATIBILITY AND WORK-PLACE HAZARDS. EFFECTS ON COMPOSITE SUBSTRATE MATERIALS MUST ALSO BE STUDIED. IT IS PROPOSED THAT PHASE I SUPPORT QUALITATIVE ANALYSIS OF VAPORIZATIVE PRODUCTS AND EFFECTS ON COMPOSITE MATERIALS. PHASE II WILL SUPPORT QUANTITATIVE CHEMICAL ANALYSIS OF VAPORIZATION PRODUCTS, DETAILED ANALYSES OF EFFECTS ON COMPOSITE MATERIALS, AND DESIGN OF A FILTRATION SYSTEM TO REMOVE POTENTIALLY TOXIC BY-PRODUCTS OF VAPORIZED PAINT. THIS SYSTEM HAS ENORMOUS COMMERCIAL POTENTIAL. IT CAN BE USED TO REMOVE PAINT FROM AIRCRAFT, BRIDGES, SHIPS, AND ANY OTHER SURFACE WITH NO ENVIRONMENTAL OR WORKPLACE HAZARDS.

LASERGENICS CORP PO BOX 33010 LOS GATOS, CA 95031 DR RICHARD SCHLECHT TITLE: SINGLE CRYSTAL GROWTH OPTIMIZATION OF MAGNESIUM DOPED LITHIUM NIOBATE T 128            OFFICE: LABCOM/MTL	ARMY	\$ 46,241
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ONE OF THE MOST IMPORTANT ELECTRO-OPTIC CRYSTALS IS LITHIUM NIOBATE.

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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IT IS PRESENTLY BEING USED FOR ELECTRO-OPTIC Q-SWITCHES, HARMONIC GENERATORS, ACOUSTO-OPTIC DEVICES, TRANSDUCERS, MODULATORS, OPTICAL PARAMETRIC OSCILLATORS AND AMPLIFIERS, OPTICAL STORAGE DEVICES AND OPTICAL BISTABLE DEVICES. THE OPTICAL QUALITY OF THE MATERIAL USED IN THESE DEVICES IS OF CRITICAL IMPORTANCE. HOWEVER, ONE OF THE MAJOR PROBLEMS WITH THIS MATERIAL IS OPTICALLY INDUCED REFRACTIVE INDEX INHOMOGENEITIES. THIS PROPOSAL ADDRESSES THE DEVELOPMENT OF AN IMPROVED OPTICAL QUALITY LITHIUM NIOBATE MATERIAL WHICH DOES NOT EXPERIENCE OPTICALLY INDUCED REFRACTIVE INDEX INHOMOGENEITIES. THIS IS ACHIEVED BY DOPING THE CRYSTAL WITH ABOUT 5% MAGNESIUM OXIDE. OUR PROGRAM OBJECTIVE IS TO OPTIMIZE THE GROWTH TECHNIQUES SO THAT THE OPTICAL LOSSES IN THE MATERIAL DUE TO SCATTERING AND ABSORPTION ARE MINIMIZED. DURING THE COURSE OF OUR PHASE I PROGRAM WE WILL DEVELOP TECHNIQUES TO ACCURATELY MEASURE THE SCATTERING LOSSES OF CRYSTAL SAMPLES AND MAKE SCATTERING LOSS MEASUREMENTS ON A REPRESENTATIVE SAMPLE OF CRYSTALS. WE WILL ALSO DEVELOP A DESIGN FOR ACCURATELY MEASURING ABSORPTION LOSSES IN CRYSTALS AND DEVELOP A CRYSTAL GROWTH PLAN FOR SYSTEMATIC DEVELOPMENT OF CRYSTALS.

LASERGENICS CORP

ARMY

\$ 49,940

PO BOX 33010

LOS GATOS, CA 95031

DR RICHARD SCHLECHT

TITLE:

NEW VIBRONIC LASER MATERIALS

T 66

OFFICE: CECOM/AMSEL

SOLID STATE TUNABLE LASER SOURCES ARE RECEIVING INCREASED ATTENTION RECENTLY BECAUSE OF THE WIDE VARIETY OF APPLICATIONS THAT THEY COULD OPEN UP IN BOTH GOVERNMENT AND INDUSTRY. THE PRESENT DAY DYE LASER SYSTEMS HAVE SERIOUS SHORTCOMINGS. THIS IS ANOTHER REASON WHY THE SOLID STATE VIBRONIC LASERS ARE OF INTEREST. THESE SYSTEMS ARE MARKED BY BROAD TUNING RANGES AND SOME SYSTEMS CAN BE OPERATED AT ROOM TEMPERATURE. HOWEVER, ALL SYSTEMS TO DATE HAVE ONE OR MORE SERIOUS DRAWBACKS SUCH AS SMALL STIMULATED EMISSION CROSS SECTION, SHORT FLUORESCENT LIFETIME OR THE NEED FOR CRYOGENIC COOLING. WE ARE PROPOSING TO INVESTIGATE GADOLINIUM ALUMINATE AS A HOST MATERIAL FOR SEVERAL POTENTIAL ACTIVE IONS. THIS MATERIAL CAN BE GROWN WITH EXCELLENT OPTICAL QUALITY. WE WILL INVESTIGATE THIS MATERIAL AS A HOST FOR THE ACTIVE IONS OF TITANIUM, CHROMIUM, VANADIUM AND COPPER. SPECTROSCOPIC SAMPLES OF UNDOPED AND DOPED MATERIAL WILL BE INVESTI-

FISCAL YEAR 1986

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GATED. MEASUREMENTS ON THE DOPED SAMPLES WILL INCLUDE ABSORPTION, FLUORESCENCE, FLUORESCENT LIFETIME, SMALL SIGNAL GAIN AND THE DOPANT CONCENTRATION. THOSE CRYSTALS THAT APPEAR TO BE THE MOST PROMISING WILL BE THE SUBJECT OF FURTHER DEVELOPMENT DURING A PHASE II PROGRAM.

LB&M ASSOCS INC 4411 W GORE - BLDG B/STE 9 LAWTON, OK 73505 DR JOSEPH E HALLORAN TITLE: ARTIFICIAL INTELLIGENCE FOR COMMAND AND CONTROL (BRIGADE COURSE OF ACTION GENERATION DECISION SUPPORT SYSTEM) T 50 OFFICE: CECOM/AMSEL	ARMY	\$ 49,623
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ARMY DOCTRINE STATES THAT QUICK, EFFECTIVE COMMAND AND CONTROL IS THE KEY TO SUCCESS ON THE BATTLEFIELD. THE INCREASING TEMPO AND LETHALITY OF THE MODERN BATTLEFIELD DICTATE AN INTELLIGENCE, AUTOMATED COMMAND AND CONTROL SYSTEM TO SUPPORT THE ATTAINMENT OF THAT ESSENTIAL QUICK AND EFFECTIVE COMMAND AND CONTROL. THIS PROJECT WILL DEFINE THE REQUIREMENTS FOR A COURSE OF ACTION (COA) GENERATION DECISION SUPPORT SYSTEM (DSS) FOR BRIGADE-LEVEL MANEUVER UNITS AND MODEL THAT DSS. THE PROJECT WILL ESTABLISH THE FOUNDATION FOR COA GENERATION SYSTEMS AT ALL MANEUVER COMMAND LEVELS AND WITHIN THE ARMY'S MAJOR FUNCTIONAL AREAS.

LB&M ASSOCS INC 4411 W GORE BLVE - STE B-9 LAWTON, OK 73505 DONALD W DOERFLER TITLE: OPERATIONAL NUCLEAR EMPLOYMENT PLANNING T 7 OFFICE: AM/SBIR	DNA	\$ 48,966
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THE VERY POLITICALLY SENSITIVE NATURE OF NUCLEAR WARFARE WOULD PRESUPPOSE THAT THE ABILITY OF THE COMMANDER TO PLAN FOR THE USE OF WEAPONS OF THIS TYPE WOULD CREATE THE NEED FOR A METHOD WHICH WOULD BE AS FOOL-PROOF AS POSSIBLE. EARLY WEAPONS WERE DESIGNATED STRATEGIC WEAPONS WHILE LATER DEVELOPED WEAPONS WERE CALLED TACTICAL. IT WAS WITH THE EVOLUTION TO TACTICAL WEAPONS THAT EXTENSIVE POSITIVE CONTROL MEASURES, DETAILED TARGET ANALYSIS AND TROOP SAFETY CONSID-



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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ERATIONS WERE THRUST INTO THE MANAGEMENT OF NUCLEAR WEAPONS. THE COMMANDER IS THE ULTIMATE MANAGER OF THE NUCLEAR WEAPONS WITHIN HIS COMMAND AND THE WEAPONS HE HAS BEEN ALLOCATED. IN ORDER TO MANAGE THESE WEAPONS, ISSUE EFFECTIVE COMMANDER'S GUIDANCE, THUS ENSURING THEIR EFFECTIVE USE, HE MUST HAVE REAL-TIME DATA. THIS PROPOSAL WILL USE THE LATEST TECHNICAL ACHIEVEMENTS IN AUTOMATION TO HANDLE COMMANDERS GUIDANCE, INTELLIGENCE DATA, AND TARGET ANALYSIS TO PROVIDE A DECISION AID FOR USE BY THE COMMANDER AND HIS STAFF. THE INTEGRATION OF TVA/ADF DECISION SUPPORT SYSTEM (TADSS), TARGET ANALYSIS PLANNING SYSTEM (TPAS) AND ADVANCED FIELD ARTILLERY TACTICAL DATA SYSTEM (AFATDS) WILL PROVIDE THE COMMANDER WITH THE TOOL HE NEEDS TO PLAN HIS USE OF NUCLEAR WEAPONS.

LCF ENTERPRISES 621 BARRINGTON CT NEWBURY PARK, CA 91320 DR DORNA C FINMAN	ARMY	\$ 49,073
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## TITLE:

A COHERENT ADAPTIVE FILTER FOR INTERFERENCE NULLING IN A DUPLEX FREQUENCY HOPPING RADIO

T 63 OFFICE: LABCOM/VAL

IN THIS PROPOSAL, COHERENT ADAPTIVE FILTERING INVOLVES INJECTING TIME DELAYED OR PHASE ADJUSTED WEIGHTED SAMPLES OF A REFERENCE INPUT INTO A SIGNAL LINE SUCH THAT THE MEAN SQUARE (MSE) OF THE SIGNALS IN THE LINE IS MINIMIZED. THIS YIELDS NULLING OF SIGNALS COHERENT WITH THE REFERENCE. THE CONVERGENCE ALGORITHM FOR ADAPTATION OF THE WEIGHTS WHICH MAKES THIS APPROACH TECHNICALLY AND ECONOMICALLY PRACTICAL FOR A STEERABLE ARRAY, FREQUENCY-AGILE RADIO IS A MODIFIED LEAST MEAN SQUARE (LMS) ALGORITHM.

LEHRER-PEARSON INC 1175 KOTTINGER DR PLEASANTON, CA 94566 J W PEARSON	AF	\$ 64,632
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## TITLE:

MICROMACHINING GaAs WAFERS

T 152 OFFICE: AFWAL/ML

MICROMACHINING GaAs WAFERS HOLD PROMISE OF FLATTER WAFERS, WITH

FISCAL YEAR 1986

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<p>BETTER PARALLELISM (UNIFORMITY OF THICKNESS), WHICH IN TURN PROMISES BETTER YIELD AND CIRCUITRY REPEATABILITY. MOREOVER, THE SAME PROCESS CAN BE USED TO PROVIDE BETTER CONTROL OF POST-CIRCUITRY THINNING. EXPERIMENTS WILL BE CONDUCTED TO IMPROVE SURFACE FINISH AND REDUCE SUBSURFACE DAMAGE. HANDLING AND CHUCKING TECHNIQUES WILL BE DEVELOPED TO REDUCE HANDLING HAZARDS AFTER THINNING.</p>		

LEHRER-PEARSON INC 1175 KOTTINGER DR PLEASANTON, CA 94566 J W PEARSON TITLE: MICROMACHINED GaAs WAFER COMPARISONS FOR THE VHSIC S-BAND AND L-BAND FET T 142	NAVY	\$ 46,630
OFFICE: NWSC		

VHSIC INTEGRATED CIRCUITRY CAN BE MADE WITH BETTER REPEATABILITY BETTER YIELD AND LOWER COST USING GaAs WAFERS WITH BETTER FLATNESS, PARALLELISM AND REDUCED CRYSTAL DAMAGE. MICROMACHINING IS A PROMISING WAFER FABRICATION PROCESS TO ACHIEVE THE DESIRED VHSIC INTEGRATED CIRCUITRY IMPROVEMENTS.

LEXIKOS CORP 69 HEATH RD NORTH ANDOVER, MA 01845 DANIEL W CORWIN TITLE: REPRESENTING KNOWLEDGE IN IDEALIZED ENGLISH T 94	AF	\$ 0
OFFICE: ASD/XR		

LEXIKOS HAS PROTOTYPED COMMON LISP SOFTWARE ABLE TO SYSTEMATICALLY FIND, MODEL, AND RELATE THE CENTRAL TOPICS OF WELL-FORMED ENGLISH TEXT, THEN RECORD THIS DATA IN A MODULAR WAY THAT LETS OTHER SOFTWARE MAKE USE OF IT. THE FOUNDATION OF OUR APPROACH IS A KNOWLEDGE REPRESENTATION FORMALISM ABLE TO ENCODE THE SEMANTICS OF ENGLISH WORD MEANINGS AND PHRASES. IT BLENDS FRAMES AND RULES UNDER A MESSAGE PASSING SCHEME, UNDER CONVENTIONS DIRECTLY REFLECTING THE APPARENTLY AD HOC NATURE OF ENGLISH PHRASE STRUCTURE RULES. THE LINGUISTIC CONVENTIONS USED IN OUR FORMALISM MAKE IT NOVEL, GENERAL, POWERFUL, AND ELEGANT. WITH IT, ANYTHING DESCRIBED IN SIMPLE ENGLISH CAN BE MAPPED

FISCAL YEAR 1986

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INTO ISOMORPHIC LISP DATA AND READILY INCORPORATED INTO A HIERARCHICAL, NETWORK-LIKE DATA BASE, EVEN ON SMALL HOST MACHINES IN THE IBM-PC CLASS. THIS KIND OF DATA BASE WILL DIRECTLY MEET THE GOALS OF THIS SBIR TOPIC. WE PROPOSE TO DESCRIBE OUR FORMALISM IN DEPTH, EXPLAIN OUR IMPLEMENTATION OF IT, GIVE CONCRETE EXAMPLES OF ITS CURRENT APPLICATIONS, AND DEFINE THE WORK STILL NEEDED TO REFINE IT INTO PRODUCTION-QUALITY UTILITY SOFTWARE.

LEXIKOS CORP  
69 HEATH RD  
NORTH ANDOVER, MA 01845  
DANIEL W CORWIN

NAVY

\$ 48,405

## TITLE:

KNOWLEDGE ACQUISITION FROM EXISTING ENGLISH TEXT  
T 150 OFFICE: NWSC

LEXIKOS HAS PROTOTYPE COMMON LISP SOFTWARE ABLE TO SYSTEMATICALLY FIND, MODEL, AND RELATE THE CENTRAL TOPICS OF WELL-FORMED ENGLISH TEXT, THEN RECORD THIS DATA IN A MODULAR WAY SO THAT OTHER SOFTWARE CAN ACCESS IT EASILY. WE PROPOSE USING AN ENHANCED VERSION OF THIS CODE TO SHOW THE FEASIBILITY OF A HIGH-VOLUME PRODUCTION OF EXPERT SYSTEMS SUCH AS THOSE CITED IN THE SBIR SOLICITATION. INSTEAD OF USING KNOWLEDGE ENGINEERS ( A SCARCE RESOURCE) TO CREATE THEM, OUR SEMI-AUTOMATED METHODS WOULD SUBSTITUTE EXISTING TEXT AS THE INFORMATION RESOURCE AND KNOWLEDGEABLE CLERICAL STAFF AS ITS EDITORS. EACH NEW EXPERT SYSTEM WOULD BE INITIATED BY HAVING OUR FINAL-VERSION SOFTWARE SCAN AND ANALYZE ONE OR MORE EXISTING ENGLISH DOCUMENTS -- TRAINING MANUALS, SYSTEM SPECS, ETC. FROM THEM, IT WOULD "EXTRACT" THE VOCABULARY, DEFINITIONS, RELATIONSHIPS, AND FACTS BOUNDING THE INTENDED PROBLEM DOMAIN. THE RESULTS OF THIS BRIEF PROCESS, COMBINED WITH PRESENTATION SOFTWARE AND MISSION-DEPENDENT EXTENSIONS, WOULD BECOME THE FIRST VERSION OF THE NEW EXPERT SYSTEM'S KNOWLEDGE BASE, AND PROVIDE A SOLID FOUNDATION FOR EXPANSION.

LICA SYSTEMS INC  
10400 EATON PL - STE 100  
FAIRFAX, VA 22030  
JOHN G ALLEN

AF

\$ 53,042

## TITLE:

TACTICAL AIR COMMAND & CONTROL INFORMATION EXCHANGE SYSTEM -  
TACCIXS  
T 37 OFFICE: ESD/XRCT

TACCIXS IS A DISTRIBUTED SYSTEM WHICH INTERCONNECTS COMMAND AND

FISCAL YEAR 1986

AWARDED BY	DEPT	AWARDED AMOUNT
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CONTROL DECISION NODES, WEAPON CONTROLLERS, SURVEILLANCE SYSTEMS AND  
CONNAISSANCE/INTELLIGENCE PRODUCTION NODES TO EXCHANGE INFORMATION  
THAT EACH MEMBER OF THE NETWORK HAS A COMMON PERSPECTIVE OF THE  
CONTINENT SITUATION; AND, EACH MEMBER IS THEN ABLE TO OPERATE IN AN  
COASTRADED MANNER. THE COMMAND AND CONTROL NODES IN THE NETWORK  
CAN INJECT COMMANDS AND ORDERS WHICH ARE ASSIMULATED BY THE OTHER  
NODES AND EMPLOYED TO SYNCHRONIZE THEIR ACTIONS. SIMILARLY, SITUATION-  
AL INFORMATION IS CIRCULATED THROUGHOUT THE NETWORK. BECAUSE  
EACH NODE HAS A COMMON, GLOBAL PERSPECTIVE, EACH NODE CAN SELECT THE  
MOST SIGNIFICANT INFORMATION TO BE SENT TO OTHERS. IN THIS MANNER,  
THE SYSTEM ADAPTS THE FLOW OF INFORMATION TO MATCH THE COMMUNICATIONS  
BANDWIDTH AVAILABLE.

<p>1. SYSTEMS INC 100 EATON PL - STE 100 FAX, VA 22030 MARVIN E LASSER TELE: MR TARGET DISCRIMINATOR T 33 OFFICE: AD/XRCS</p>	AF	\$ 56,996
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THE STATE OF THE ART OF LASERS MAKES IT FEASIBLE TO "LISTEN" TO  
REMOTE TARGETS WHICH CAN BE APPRECIABLE DISTANCES AWAY. THIS IS  
ACCOMPLISHED BY USING A LASER AS A DOPPLER MOTION DETECTOR. ALSO  
BECAUSE OF THE UNIQUE CHARACTERISTICS OF VIBRATING MACHINERY, (E.G.,  
ENGINE WITH ITS ENGINE RUNNING) ITS SIGNAL CAN BE READILY SEPARATED  
FROM THE DOPPLER SHIFT THAT WOULD RESULT FROM THE GROUND RETURN FROM  
LASER BEAMED FROM A RAPIDLY MOVING AIRCRAFT OR FROM RETURNS FROM  
OBJECTS MOVING IN THE WIND. THE OBJECTIVE OF THIS RESEARCH PROGRAM  
IS TO SHOW THAT AN ACTIVE "REAL TARGET" WILL UNIQUELY MODULATE REF-  
LECTED LASER ENERGY DUE TO VIBRATIONS ON THE TARGET'S SURFACE  
CAUSED BY ACTIVITY WITHIN THE TARGET (E.G. ENGINE RUNNING) OR BY THE  
TARGET (I.E. MOVEMENT OF TRACKS, WHEELS).

<p>1. SYSTEMS INC 100 EATON PL - STE 100 FAX, VA 22030 G ALLEN TELE: CONTROL NETWORK FOR ROBOTIC COMBAT (CNCB) T 113 OFFICE: TACOM AMSTA</p>	ARMY
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PROOC IS A DISTRIBUTED SYSTEM

AD-A105 204 DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM 4/7  
(SBIR) ABSTRACTS OF PHASE I AWARDS (1986)(U) DEPARTMENT  
OF DEFENSE WASHINGTON DC 1986

AD-A105 204 DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM 4/7  
(SBIR) ABSTRACTS OF PHASE I AWARDS (1986)(U) DEPARTMENT  
OF DEFENSE WASHINGTON DC 1986

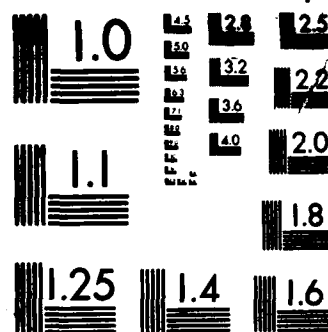
AD-A105 204 DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM 4/7  
(SBIR) ABSTRACTS OF PHASE I AWARDS (1986)(U) DEPARTMENT  
OF DEFENSE WASHINGTON DC 1986

UNCLASSIFIED OF DEFENSE WASHINGTON DC 2000 F/G 5/1 NL

UNCLASSIFIED OF DEFENSE WASHINGTON DC 2000 F/G 5/1 NL

UNCLASSIFIED OF DEFENSE WASHINGTON DC 2000 F/G 5/1 NL

A 10x10 grid of squares, with the top-left square missing, representing a 10x10 grid of squares.



MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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RECONNAISSANCE SYSTEMS AND COMMAND AND CONTROL SYSTEMS TO EXCHANGE INFORMATION SO THAT EACH MEMBER OF THE NETWORK HAS A COMMON PERSPECTIVE OF THE PERTINENT SITUATION. THE COMMAND AND CONTROL NODES IN THE NETWORK CAN INJECT COMMANDS AND ORDERS WHICH ARE ASSIMILATED BY THE OTHER NODES AND EMPLOYED TO SYNCHRONIZE THEIR ACTIONS. SIMILARLY, SITUATIONAL INFORMATION IS CIRCULATED THROUGHOUT THE NETWORK. BECAUSE EACH NODE HAS A COMMON, GLOBAL PERSPECTIVE, EACH NODE CAN SELECT THE MOST SIGNIFICANT INFORMATION TO BE SENT TO OTHERS. IN THIS MANNER, THE SYSTEM ADAPTS THE FLOW OF INFORMATION TO MATCH THE COMMUNICATIONS BANDWIDTH AVAILABLE. IT INHERENTLY PERFORMS BANDWIDTH REDUCTION.

LIGHTWAVE ELECTRONICS CORP. 897-4A INDEPENDENCE AVE. MT. VIEW, CA 94043 RICHARD W. WALLACE TITLE: RANGE MEASUREMENT WITH A LASER DIODE PUMPED Q-SWITCHED SOLID STATE LASER	SDIO	\$ 56,120
T      3      OFFICE:		

THIS PROPOSAL IS TO STUDY AND DEVELOP LASER COMPONENTS WHICH COULD BE USED WITHIN A LASER SYSTEM FOR MEASURING THE RANGE AND RATE OF CHANGE IN RANGE (RANGE RATE) OF OBJECTS. THE MEASUREMENT SYSTEM WILL BE STUDIED AND RESEARCH WILL BE PERFORMED ON LASER-DIODE PUMPED Q-SWITCHED LASER OSCILLATORS AT 1.06 MICRONS BASED AROUND THE RESULTS OF THE SYSTEM EVALUATION. MINIATURE LASER DIODE PUMPED Nd:YAG LASERS HAVE RECENTLY BEEN BUILT THAT ALLOW COHERENT DETECTION TO BE USED IN RANGE MEASUREMENT. THESE LASERS HAVE NOT BEEN Q-SWITCHED. Q-SWITCHED OPERATIONS GIVE SHORT PULSES OF LIGHT THAT ARE APPROPRIATE FOR VERY SIMPLE INCOHERENT RANGING SYSTEMS. THE PROPOSED RESEARCH WILL LEAD TO A HIGH REPETITION RATE Q-SWITCHED MINIATURE LASER THAT CAN BE USED IN CONJUNCTION WITH A LASER AMPLIFIER OR DIRECTLY AS A SOURCE IN LASER MEASUREMENT OF RANGE AND RANGE RATE. THE INHERENT ADVANTAGES OF THIS TYPE OF OPTICAL SOURCE INCLUDE RUGGEDNESS, LONG LIFE, SMALL SIZE AND LOW COST. PHASE I WORK WILL BE DEVOTED TO EVALUATION AND CONCEPTUAL DESIGN OF THE SYSTEM AND EVALUATION AND PRELIMINARY DESIGNS OF THE MINIATURE Q-SWITCHED LASER.

LISP MACHINE INC 6033 W CENTURY BLVD - STE 900 LOS ANGELES, CA 90045 DR DAVID LEINWEBER TITLE: ARTIFICIAL INTELLIGENCE TOOLS FOR DIAGNOSTIC TESTING	NAVY	\$ 50,000
T      97      OFFICE: NSWC		

ARTIFICIAL INTELLIGENCE TECHNIQUES, PARTICULARLY KNOWLEDGE-BASED

FISCAL YEAR 1986

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AMOUNT

SYSTEMS, OFFER THE POTENTIAL FOR MAJOR IMPROVEMENTS IN DIAGNOSTIC TESTING AND MAINTENANCE. THERE ARE APPLICATIONS FOR KNOWLEDGE-BASED SYSTEMS THROUGHOUT THE DESIGN AND LIFE CYCLE OF ANY COMPLEX SYSTEM. DESIGN-FOR-TESTIBILITY AND INTELLIGENT BUILT-IN TEST ARE IMPORTANT ASPECTS OF AI APPLICATIONS FOR FUTURE SYSTEMS OR THOSE IN EARLY DEVELOPMENT. THERE ARE ALSO MANY APPLICATIONS FOR ARTIFICIAL INTELLIGENCE TECHNOLOGY IN THE DIAGNOSIS AND MAINTENANCE OF EXISTING EQUIPMENT AND SYSTEMS. EXPERT SYSTEMS ARE ABLE TO CAPTURE AND DISSEMINATE EXPERIENCE, INTEGRATE A WIDE VARIETY OF KNOWLEDGE TYPES, INCLUDING EXPERIENTIAL KNOWLEDGE PHYSICAL PRINCIPLES, HEURISTIC RULES OF THUMB, AND DETAILED CONSIDERATION OF THE SYMPTOMS IN BRINGING A WIDE VARIETY OF LOGICAL TECHNIQUES TO THE DIAGNOSTIC PROCESS. AN UNDERSTANDING OF STRUCTURE AND FUNCTION CAN BE USED TO DETERMINE THE CAUSES OF OBSERVED FAULTS. OPTICAL TEST SEQUENCING AND MINIMIZATION ARE ALSO GREATLY FACILITATED BY THE USE OF AI TECHNIQUES. TO DATE, HOWEVER, THE APPLICATION OF AI TO DIAGNOSTICS HAS LARGELY BEEN IN AN EXPERIMENTAL OFF-LINE FASHION. WE PROPOSE TO DEVELOP THE LINKING TECHNOLOGIES WHICH WILL ALLOW ARTIFICIAL INTELLIGENCE SYSTEMS TO ACCESS A WIDE RANGE OF STANDARD BUS-DRIVEN INSTRUMENTATION AND ATLAS COMPATIBLE AUTOMATIC TEST EQUIPMENT. THESE LINKS WILL PROVIDE THE BASIS FOR THE DIRECT APPLICATION OF ANY NUMBER OF AI TECHNIQUES TO THE SOLUTION OF REAL WORLD MAINTENANCE PROBLEMS. IN ADDITION, AI OFFERS THE POTENTIAL FOR FAST IMPROVEMENTS IN THE QUALITY AND EFFICIENCY OF PROGRAMS WRITTEN IN ATLAS, THE MOST WIDELY USED TEST EQUIPMENT CONTROL LANGUAGE.

LJF CORP  
411 S LONDON AVE  
S EGG HARBOR CITY, NJ 08215  
HENRY A FROSCH

ARMY

\$ 33,107

## TITLE:

INTERFACE AND DIGITAL RECORDING ELECTRONICS FOR AIRBORNE TEST  
SYSTEM

T 70

OFFICE: CECOM/AMSEL

DESIGN AND DEVELOPMENT OF SPECIAL INTERFACES, HARDWARE AND SOFTWARE, TO BE USED BETWEEN THE INSTRUMENTATION COMPLEMENT OF THE ARMY'S ASSET TEST-BED AIRCRAFT AND A VARIETY OF SENSORS, INSTRUMENTS, TARGET RECOGNIZERS, DIGITAL SCAN CONVERTERS, TARGET TRACKERS AND THE INERTIAL NAVIGATION SYSTEM. DESIGN AND DEVELOPMENT OF FIBER OPTICS LINK FOR ANALOG OR DIGITAL VIDEO TRANSMISSION.



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
LNR COMMUNICATIONS INC 180 MARCUS BLVD HAUPPAUGE, NY 11788 H DEGRUYL TITLE: THERMALLY COOLED SPACECRAFT LOW NOISE AMPLIFIER DESIGN STUDY T 65 OFFICE: AFSTC/OLAB	AF	\$ 49,791

A NEED EXISTS FOR SPACE QUALIFIED EHF LOW NOISE RECEIVER FRONT-ENDS OPERATING AT FREQUENCIES OF 44 GHz AND UP. RECENT ADVANCES IN THE AREA OF HEMT DEVICE TECHNOLOGY MAKE IT POSSIBLE TO DEVELOP A SPACE QUALIFIABLE LOW NOISE AMPLIFIER WITH GAIN AND NOISE FIGURE PERFORMANCE APPROACHING THAT PREVIOUSLY AVAILABLE ONLY WITH PARAMETRIC AMPLIFIERS. TO ACHIEVE THESE NOISE PERFORMANCE LEVELS IT IS HOWEVER NECESSARY TO COOL THE HEMT DEVICE THEREBY REDUCING ITS THERMAL NOISE CONTRIBUTION. ACCORDINGLY, THE PROPOSED PHASE I PROGRAM ENTAILS THE PERFORMANCE OF A DESIGN STUDY TRADEOFF ANALYSIS CULMINATING IN THE GENERATION OF A PREFERRED DESIGN APPROACH FOR A SIMPLE, LIGHTWEIGHT, LOW COST HEMT LNA AT 44 GHz WITH NOISE FIGURE AND GAIN OF 3-4 dB AND 10-15 dB RESPECTIVELY. ESPECIALLY THE STUDY WILL CONCENTRATE ON FIVE TECHNOLOGICAL AREAS TRADING OFF ELECTRICAL, THERMAL AND MECHANICAL DESIGN PRINCIPLES TO ACHIEVE MAXIMUM NOISE PERFORMANCE. AREAS TO BE INVESTIGATED ARE: 1) HEMT DEVICE TECHNOLOGY STATUS, 2) ACTIVE COOLING METHODS, 3) RF CIRCUIT DESIGN, 4) THERMAL TRANSFER/MECHANICAL STRUCTURE AND 5) SPACECRAFT INTERFACE. THE COOLED LNA DESIGN CONCEPTS, SO GENERATED, WILL ALTHOUGH FOCUSED AT 44 GHz BE DIRECTLY TRANSFERABLE TO OTHER EHF FREQUENCIES OF OPERATION.

LNR COMMUNICATIONS INC 180 MARCUS BLVD HAUPPAUGE, NY 11788 JULIUS R ASMUS TITLE: MILLIMETER WAVE GaAs IMPATT MATERIAL DEVICES AND TECHNOLOGY T 80 OFFICE: LABCOM/ETDL	ARMY	\$ 49,429
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GALLIUM ARSENIDE (GaAs) IMPATT DIODES HAVE GENERATED MORE RF POWER AND HIGHER CONVERSION EFFICIENCIES BOTH IN THE PULSED AND CONTINUOUS WAVE OPERATING MODE AND DEMONSTRATED BETTER RADIATION HARDENING, THAN

FISCAL YEAR 1986

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DEPT

AWARDED  
AMOUNT

ANY OTHER EHF SOLID STATE POWER GENERATING DEVICE. HISTORICALLY, SUBSTANTIAL DIFFICULTIES HAVE CONFRONTED THE IMPATT DEVICE MANUFACTURERS IN ACHIEVING THEORETICAL PREDICTED PERFORMANCES WITH GOOD YIELD AND REPEATABILITY. CONSEQUENTLY THE COST AND AVAILABILITY OF PRODUCTION QUANTITIES REMAINS A CONCERN FOR THE IMPATT DIODE END USERS OF BOTH THE INDUSTRY AND GOVERNMENT. TO EXPLOIT THE ADVANTAGES OF GaAs IMPATT DEVICES, LNR COMMUNICATIONS, INC., PROPOSES A PHASE I STUDY LEADING TO A PHASE II IMPLEMENTATION. THE STUDY OF THEORETICAL DESIGNS AND EXPERIMENTAL CONCEPTS WILL ADDRESS IMPATT TECHNOLOGY IMPROVEMENTS IN CURRENT EPITAXIAL MATERIAL GROWTH, IN WAFER-TO-WAFER UNIFORMITY AND REPRODUCIBILITY, IN COMPUTER AIDED LARGE SIGNAL SIMULATION OF IMPATT OPERATION, IN HIGH PERFORMANCE DEVICE YIELDS AND IN BETTER UNDERSTANDING OF SECOND ORDER PHYSICAL LIMITATIONS RELATING TO GaAs MATERIALS AND IMPATT DEVICES.

LOS ALAMOS TECHNICAL ASSOCS INC

DNA

\$ 49,941

1501 WILSON BLVE - STE 801

ARLINGTON, VA 22209

THOMAS A GIACOFI

TITLE:

PREDICTION TECHNIQUES FOR AND ASSESSMENT OF EQUIPMENT VULNERABILITY TO AIRBLAST-INDUCED SHOCK

T

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OFFICE: AM/SBIR

THE DAMAGING EFFECTS OF NUCLEAR AIRBLAST, THERMAL AND PROMPT RADIATION, AND EMP ON EXPOSED EQUIPMENT AND STRUCTURES ARE WELL KNOWN. AN ADDITIONAL, LESS WIDELY RECOGNIZED BUT POTENTIALLY SERIOUS NUCLEAR EFFECT IS THAT OF AIRBLAST-INDUCED SHOCK (ABIS). EQUIPMENT MOUNTED INSIDE AN ENCLOSED SPACE CAN BE EXPOSED TO LARGE INDUCED VELOCITIES AND ACCELERATIONS, PRIMARILY IN THE HORIZONTAL DIRECTION. THE INTENT OF THE PROPOSED EFFORT IS TO CHARACTERIZE THE ABIS ENVIRONMENT, AND ASCERTAIN THE ABIS VULNERABILITY OF REPRESENTATIVE MISSION-ESSENTIAL SYSTEMS, BASED ON ANALYSIS OF EXISTING MEASURED DATA. VULNERABLE SYSTEM COMPONENTS WILL BE CATEGORIZED, AND CORRELATED WITH PEAK VELOCITY LEVELS CORRESPONDING TO ONSET OF DAMAGE. IF ABIS EFFECTS ARE DETERMINED TO BE A SERIOUS THREAT, A COMPUTERIZED ANALYTICAL METHOD FOR PREDICTING THE ABIS ENVIRONMENT WILL BE DESIGNED. THE METHOD WILL PROVIDE THE BASE INPUT MOTIONS REQUIRED BY EQUIPMENT DESIGNERS TO DEVELOP HARDENED, SURVIVABLE EQUIPMENT. IN PHASE I, THE PRELIMINARY PROGRAM SPECIFICATION WILL BE DEVELOPED.

## FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
LUNN INDUSTRIES INC 1617 STRAIGHT PATH WYANDANCH, NY 11798 ROY C BERG TITLE: ANTENNA MAST TRIDENT OE-207 REDESIGN AND IMPROVEMENT PROGRAM T 42 OFFICE: SPAWAR	NAVY	\$ 49,772

TO REDUCE THE COST OF THE EXISTING ANTENNA MAST AND TO IMPROVE ITS PERFORMANCE, A STUDY WILL BE ACCOMPLISHED THAT WILL EVALUATE BOTH THE MATERIALS AND THE MANUFACTURING PROCESS. AS A RESULT OF THE NEW MATERIALS DEVELOPMENTS IN INDUSTRY AND THE ACQUISITION OF THE ADVANCED SIX AXIS TAPE/FILAMENT WINDING EQUIPMENT AT LUNN, WE ANTICIPATE BEING ABLE TO REDUCE THE WEIGHT OF THE STRUCTURE BY 15%, WITH A 30% INCREASE IN MAST STIFFNESS AND A RELATED COST DECREASE OF 20% THROUGH USE OF AUTOMATED MANUFACTURING PROCESSES. PHASE II WILL BE TO FABRICATE FULL SCALE COMPONENTS AND TEST TO PROVE THE BETTER PROPERTIES AND VERIFY THE COST SAVINGS.

M.D. ENGINEERING 214 LINCOLN CENTRE DR FOSTER CITY, CA 94404 WAYNE ROGERS TITLE: HUMAN CORE TEMPERATURE MEASURING DEVICE T 219 OFFICE: AMRDC/SGRD	ARMY	\$ 50,000
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TO DEVELOP THREE HUMAN CORE TEMPERATURE MEASURING DEVICES HAVING A RANGE OF ONE METER AND ACCURACY OF + OR - .1 DEG F USING A MICRO MINIATURE FM TRANSMITTER WITH A TEMPERATURE SENSITIVE VOLTAGE CONTROLLED OSCILLATOR MODULATING THE FM CARRIER. THE CONSTRUCTION OF THE TRANSMITTER CAN BE ACCOMPLISHED BY THREE METHODS: SURFACE MOUNT TECHNOLOGY, HYBRID TECHNOLOGY OR CUSTOM INTEGRATED CIRCUIT. POWER TO BE SUPPLIED IN TWO WAYS: BY BATTERY OR A BIO BATTERY USING THE STOMACH ACID AS AN ELECTROLITE.

MACAULAY-BROWN INC 3989 COLONEL GLENN HIGHWAY FAIRBORN, OH 45324 SHERMAN O ROSS TITLE: ARTIFICIAL INTELLIGENCE FOR ELECTRONIC WARFARE SYSTEMS T 61 OFFICE: CECOM/AMSEL	ARMY	\$ 48,795
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THE ARMY IS CURRENTLY DEVELOPING/PROCURING FULLY AUTOMATIC SELF

FISCAL YEAR 1986

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PROTECTION ELECTRONIC WARFARE SYSTEMS. SOME OF THESE SYSTEMS, LIKE THE ALQ-136 (SEMA) AND THE APR-39 (XE-2), HAVE FUNCTIONS WHICH ARE SOFTWARE REPROGRAMMABLE TO ALLOW THE SYSTEM PERFORMANCE TO BE TAILORED FOR SPECIFIC MISSIONS. THE ORIGINAL MISSION PROGRAMMING, A COMPLEX SOPHISTICATED PROCESS WITH MANY INTERACTIVE ELEMENTS, IS PERFORMED BY THE DEVELOPING CONTRACTOR. IT IS ULTIMATELY THE USER'S RESPONSIBILITY TO DEVELOP MISSIONIZED PROGRAMS FOR THESE SYSTEMS. THE EXPERIENCE AND EXPERTISE OF THE DEVELOPING CONTRACTOR IS NOT AVAILABLE TO THE USER. THE USER MUST BE ABLE TO EFFICIENTLY PROGRAM MISSION CHANGES AND DEVELOP REASONABLE ESTIMATES OF HOW THESE CHANGES IMPACT TOTAL SYSTEM PERFORMANCE. AN ARTIFICIAL INTELLIGENCE COMPUTER PROGRAM, CALLED AN EXPERT SYSTEM, CAN BE DEVELOPED THAT WOULD PROVIDE THE USER GUIDANCE ON HOW TO CHANGE THE MISSION PROGRAM, WHAT CHANGES ARE NEEDED TO ACHIEVE A DESIRED RESULT, AND WHAT IMPACTS THE CHANGES WILL HAVE ON OVERALL SYSTEM PERFORMANCE. IN THIS FEASIBILITY STUDY, MACAULAY-BROWN PROPOSES TO PERFORM AN ANALYSIS OF THE ALQ-136 (SEMA) MISSIONIZATION PROCESS, DETERMINE WHAT IS REQUIRED TO BUILD AN EXPERT SYSTEM TO GUIDE THAT PROCESS, AND DESCRIBE SUCH AN EXPERT SYSTEM, INCLUDING INPUT REQUIREMENTS, OPERATING PROCEDURE, AND OUTPUT RESULTS. THE STUDY WILL ENABLE AN ASSESSMENT OF THE SCOPE OF BUILDING SUCH AN EXPERT SYSTEM AND THE BENEFITS GAINED FROM IT.

MACAULAY-BROWN, INC.  
3989 COLONEL GLENN HIGHWAY  
FAIRBORN, OH 45324  
MARTIN S. MORAN

ARMY \$ 49,706

TITLE:  
MULTIPATH EFFECTS ANALYSIS PROGRAM  
T 62 OFFICE: CECOM/AMSEL

MULTIPATH PROBLEMS ASSOCIATED WITH RADAR TRACKING OF LOW FLYING TARGETS ARE A WELL KNOWN PHENOMENON. EXCEPT FOR TERRAIN BOUNCE ECM, MULTIPATH EFFECTS HAVE NOT BEEN EXPLOITED FOR PURPOSES OF ENHANCING ECM TECHNIQUE EFFECTIVENESS. IF MULTIPATH EFFECTS CAN BE EXPLOITED TO AID TECHNIQUE EFFECTIVENESS, THERE COULD BE IMPACTS TO TECHNIQUE DESIGN AND JAMMER POWER REQUIREMENTS. DURING PHASE I, MACAULAY-BROWN, INC. PROPOSES TO EXPLORE THE FEASIBILITY OF EXPLOITING MULTIPATH EFFECTS BY ANSWERING TWO FUNDAMENTAL QUESTIONS: a) HOW MUCH OF THE TIME DURING A THREAT ENGAGEMENT IS A LOW ALTITUDE COMBAT AIRCRAFT IN A POSITION SUCH THAT THE TERRAIN BETWEEN THE JAMMER AND THE THREAT ANTENNA WILL SUPPORT MULTIPATH? b) DURING THOSE PERIODS IN WHICH

FISCAL YEAR 1986

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MULTIPATH EXISTS, WHAT IS THE JAMMING SIGNAL STRENGTH RATIO OF THE DIRECT PATH TO INDIRECT PATH FOR DIFFERENT ENGAGEMENT GEOMETRIES AND TERRAIN TYPES; AND WHAT ARE THE ACTUAL VALUES OF THE TWO SIGNAL (DIRECT AND INDIRECT) FOR DIFFERENT TERRAIN/RCS/THREAT/JAMMER COMBINATIONS? ANSWERING THESE QUESTIONS WILL INDICATE WHETHER AN AIRCRAFT FLYING A REALISTIC COMBAT ENGAGEMENT CARRYING NOMENCLATURED EQUIPMENT CAN EXPECT TO EXPLOIT MULTIPATH EFFECTS. GIVEN THAT THE CONCEPT PROVES FEASIBLE, THE PHASE II EFFORT WILL DETERMINE OPTIMUM TECHNIQUE PARAMETERS FOR EXPLOITING MULTIPATH EFFECTS.

MACAULAY-BROWN, INC. 3989 COLONEL GLENN HIGHWAY FAIRBORN, OH 45324 DR. E.E. WISNIEWSKI TITLE: COMBINED IRCM ANALYSIS T 62 OFFICE: CECOM/AMSEL	ARMY	\$ 49,978
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US ARMY COUNTERMEASURE (CM) EQUIPMENT DEVELOPERS HAVE THE RESPONSIBILITY TO DEVELOP CM'S WITH THE CAPABILITY TO PROTECT US ARMY AIRCRAFT AGAINST OLDER, RECENTLY INTRODUCED AND FUTURE THREATS INCLUDING IR OMING MISSILES. AGAINST RECENTLY INTRODUCED AND FUTURE THREATS, CURRENT CM'S AND THEIR METHOD OF USE TACTICS MAY HAVE REDUCED OR LIMITED EFFECTIVENESS OR MAY NOT BE EFFECTIVE AT ALL. THIS REALIZATION HAS PROMOTED THE DEVELOPMENT OF NEW, OFTEN TIMES EXPENSIVE, HIGH PERFORMANCE CM'S TO PROVIDE A CAPABILITY AGAINST SUCH THREATS. THIS EFFORT PROPOSES TO INVESTIGATE THE BENEFITS OF COMBINING CURRENT IRCM TECHNIQUES AND THEIR USE TO DEFEAT RECENTLY INTRODUCED OR FUTURE THREATS. ADDITIONALLY THIS EFFORT CAN PROVIDE PRELIMINARY DATA FOR IDENTIFYING COMBINED IRCM TECHNIQUES WHICH REQUIRE CM SYSTEMS WHICH MAY REQUIRE LESS COSTLY AND/OR REQUIRE LESS STRINGENT PERFORMANCE REQUIREMENTS THAN THE HIGH PERFORMANCE CM UNDER DEVELOPMENT OR THOSE PROJECTED FOR DEVELOPMENT.

MACAULAY-BROWN, INC. 3989 COLONEL GLENN HIGHWAY FIARBORN, OH 45324 CHARLES G. BROWN TITLE: SPECIAL WAVEFORM ECM EFFECTIVENESS ANALYSIS - PD/SEEKER T 62 OFFICE: CECOM/AMSEL	ARMY	\$ 49,963
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PRACTICAL CONSIDERATIONS OF COST, SIZE, WEIGHT AND POWER CONSUMPTION

FISCAL YEAR 1986

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FOR EW EQUIPMENT LEAD THE ARMY, AND OTHER SERVICES, TO EXAMINING WAYS AND MEANS OF OBTAINING MAXIMUM BENEFIT FROM EXISTING OR EMERGING EW SYSTEMS BY MAKING BEST USE OF "NON-EXOTIC" ECM TECHNIQUES. THE EXISTENCE OF ADVANCED DOPPLER THREAT TRACKING SYSTEMS MAKES THIS EXAMINATION MORE COMPLEX AND IS MORE DEMANDING FOR ECM. SPECIAL WAVEFORM ECM TECHNIQUES ARE A CLASS OF "NON-EXOTIC" TECHNIQUES THAT HAVE SHOWN SOME PROMISE IN THIS AREA BUT HAVE NOT BEEN FULLY DEVELOPED, ANALYZED, AND EVALUATED. THE OBJECTIVE OF THIS PROPOSED AREA OF WORK IS TO DESIGN, ANALYZE, ASSESS, EVALUATE AND OPTIMIZE SPECIAL WAVEFORM ECM TECHNIQUES AGAINST THREAT SYSTEMS USING DOPPLER AND MONOPULSE PRINCIPLES. THE PRIMARY TOOL TO BE USED IN THIS WORK AREA IS COMPUTER MODELING AND ANALYSIS BASED ON THE EXISTING MTS ECM EFFECTIVENESS EVALUATION MODEL. THE SPECIFIC OBJECTIVE/PURPOSE OF THE PROPOSED PHASE I WORK IS TO MODIFY SOME EXISTING MTS STRUCTURES TO INCORPORATE A DOPPLER TRACKING LOOP AND VELOCITY ECM TECHNIQUES IN THOSE MODEL STRUCTURES. WITH COMPLETION OF PHASE I, COMPUTER MODELS WILL BE A PLACE SO THAT DESIGN, ANALYSIS AND EVALUATION CAN BE ACCOMPLISHED AND THE OVERALL OBJECTIVE REACHED.

MAINTENANCE REQUIREMENTS INC	NAVY	\$ 49,980
76 SOUTHWOOD DR		
ORINDA, CA 94563		
EPHRAIM REGELSON		
TITLE:		
APPLICATION OF ROBOTICS TECHNOLOGY TO REPAIR OF ELECTRONIC PRINTED CIRCUIT BOARDS		
T 101	OFFICE: NSWC	

THIS SUBMITTAL EXTENDS APPLICATION OF ROBOTICS AND AUTOMATED FACTORY TECHNIQUES TO THE REPAIR OF ELECTRONIC PRINTED CIRCUIT BOARDS. INCREASES IN PERFORMANCE, QUALITY ASSURANCE, AND RELIABILITY UNFORTUNATELY HAVE NOT RESULTED IN FAILURE FREE SYSTEMS. IN ORDER TO FUNCTION THE NAVY MUST SUPPORT AN EXTENSIVE AND EXPENSIVE MAINTENANCE PROGRAM. MANY OF THE REPAIR PROCESSES ARE VERY LABOR INTENSIVE, REQUIRE HIGHLY SPECIALIZED TRAINING AND ARE SOMETIMES VERY HAZARDOUS. AN EXAMPLE OF THIS IS THE REMOVAL OF CONFORMAL COATINGS FROM ELECTRONIC PRINTED CIRCUIT CARDS. IN THIS SBIR SUBMITTAL MAINTENANCE REQUIREMENTS INC. (MRI) PROPOSES TO DETERMINE THE FEASIBILITY OF APPLYING ROBOTICS TECHNOLOGY TO THE PROBLEM OF CONFORMAL COATING REMOVAL AND TO STRUCTURE A PILOT PROGRAM TO DEMONSTRATE THE CONCEPT. THE WORK WILL BE DONE BY THE SAME KEY INDIVIDUALS WHO DEVELOPED AND IMPL-

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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MENTED THE NAVY-WIDE MINIATURE MICROMINIATURE (2M) REPAIR PROGRAM.

MANAGEMENT ENGINEERING & MICROEXPERT SYS 21405 DEVONSHIRE BLVD - #219-220 CHATSWORTH, CA 91313 HERMAN SIEGEL	NAVY	\$ 49,970
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## TITLE:

PLANNING ANALYST: AN EXPERT SYSTEM FOR CAPTURING PLANNING EXPERTISE  
T 150 OFFICE: NWSC

PLANNING ANALYST IS AN EXPERT SYSTEM DESIGNED TO CAPTURE, PRESERVE, AND ULTIMATELY TRANSMIT THE EXPERTISE OF MANUFACTURING PLANNERS. MANUFACTURING PLANNING IS A VARIOUS, COMPLEX, AND SUBTLE ACTIVITY THAT CAN BE DIVIDED INTO TWO KINDS OF KNOWLEDGE: MECHANICAL/FACTUAL AND JUDGEMENTAL/HEURISTIC. THE FORMER HAS BEEN SUBJECT TO COMPUTERIZATION, BUT THE LATTER DEPENDS ON THE SPECIFIC EXPERIENCES OF PLANNING EXPERTS AND SO FAR HAS RESISTED QUANTITATIVE ANALYSIS. HEURISTIC KNOWLEDGE GENERATES THE INDIRECT MANUFACTURING COST FACTORS AND REMAINS THE MOST CRITICAL CONTROL ON PRODUCTIVITY AND PROFITS. PLANNING ANALYST WILL CREATE A KNOWLEDGE BASE THAT ACCOUNTS FOR FACTUAL AND HEURISTIC DATA. TO SUPPORT THE KNOWLEDGE GATHERING EFFORT, THE DESIGNERS WILL CONSTRUCT A KNOWLEDGE ENGINEERING LANGUAGE ABLE TO ACCEPT INPUTS IN ENGLISH LANGUAGE, AND WILL SUPPLEMENT THEIR KNOWLEDGE ENGINEERING STAFF WITH KNOWLEDGE EXPERTS WHOSE SKILLS LAY DIRECTLY IN MANUFACTURING PLANNING AND IN UNDERSTANDING THE MECHANICS OF INFORMALLY TRANSMITTED KNOWLEDGE. PLANNING ANALYST WILL CHAIN FORWARDS AND BACKWARDS THROUGH FRAMES AND RULESETS, AND WILL OTHERWISE FEATURE THE USUAL CHARACTERISTICS OF INFERENCE DRIVEN KNOWLEDGE SYSTEMS.

MANAGEMENT SUPPORT SERVICES BOX 3617 FEDERAL WAY, WA 98063 ALBERT H OLESBERG	AF	\$ 0
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TITLE:  
MAINTENANCE ANALYSIS SELECTED AIRCRAFT ENGINES  
T 105 OFFICE: ASD/YZ

THE PURPOSE OF THIS STUDY IS TO INTEGRATE THE APPLICABLE FIELD, DEPOT AND OTHER AIR FORCE MAINTENANCE DATA INTO A SINGLE AND CONCISE MAINTENANCE HISTORY OR BASIC DATA PACKAGE. THIS PACKAGE OR HISTORY

FISCAL YEAR 1986

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AMOUNT  
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IS DESIGNED TO CONTAIN THE INFORMATION REQUIRED BY ALL OF THE USING DISCIPLINES, TO INCLUDE ALL OF THE CONTRIBUTING MAINTENANCE LEVELS (HARDWARE REPAIR, REMOVE AND REPLACE, CHECKED OK, ETC) AND, FINALLY, ANY AND ALL OF THE ORGANIZATIONAL/HARDWARE LEVELS. THE LATTER GROUPING WOULD INCLUDE THE FOLLOWING; FROM THE SYSTEM TOTAL TO THE INDIVIDUAL PART NUMBER, THE ORGANIZATION, SHOP AND DEPOT LEVELS, R&M FACTORS AND MANHOUR AND DOLLAR DATA. A SECONDARY OBJECTIVE IS TO SUPPORT THE BASIC DATA PACKAGE WITH A REPORT GENERATOR ORGANIZED AND/OR CAPABLE OF SORTING AND PRINTING, IN COST DRIVER ORDER, ANY OF THE SUBJECTS DESIRED.

MANAGEMENT SUPPORT TECHNOLOGY INC

DARPA

\$ 50,000

1560 BROADWAY - STE 755

DENVER, CO 80202

DR DAN POPOV

TITLE:

DESCRIPTIVE PSYCHOLOGY APPROACH TO PERFORMANCE EVALUATION OF  
ARTIFICIAL INTELLIGENCE SYSTEMS

T 16

OFFICE: DARPA

DESCRIPTIVE PSYCHOLOGY IS A FORMAL REPRESENTATION SYSTEM THAT HAS ANTICIPATED THE TIME WHEN THE BEHAVIOR OF THE COMPUTER WOULD EMULATE THAT OF A PERSON. BECAUSE OF THIS, IT HAS THE POTENTIAL TO SERVE AS THE BASIS FOR THE CRITERIA BY WHICH THE PERFORMANCE OF "EXPERT SYSTEM" AND OTHER ARTIFICIAL INTELLIGENCE SOFTWARE CAN BE EVALUATED AND DIRECTLY COMPARED WITH OTHER PROGRAMS AND THE PERFORMANCE OF A HUMAN IN SIMILAR SITUATIONS. THIS FORMULATION HAS BEEN USED AS THE BASIS FOR MICROCOMPUTER BASED EXPERT SYSTEMS AND IT IS PROPOSED THAT IT BE USED TO DEVELOP AN EVALUATION SYSTEM FOR ARTIFICIAL INTELLIGENCE SOFTWARE.

MANATECH ASSOCS

ARMY

\$ 48,199

PO BOX 37 - 824 N MAIN ST

BELLEFONTAINE, OH 43311

BRYAN L GLETT

TITLE:

ACTIVE OSCILLATOR PHASE NOISE REDUCTION

T 89

OFFICE: LABCOM/ETDL

IT IS PROPOSED TO REDUCE VIBRATION-INDUCED PHASE NOISE IN CRYSTAL



FISCAL YEAR 1986

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AMOUNT

OSCILLATORS BY A COMPACT ARRANGEMENT OF ACTIVE MOUNTINGS. SUCH MOUNTINGS ARE ENVISAGED AS PIEZOELECTRIC BENDER ELEMENTS ARRANGED SO THAT VIBRATIONS OF A BROAD BANDWIDTH AND MODERATE AMPLITUDE ARE ABSORBED IN 1 TO 3 AXES. WHILE THE MOST CONSERVATIVE ARRANGEMENT WOULD REQUIRE AN ELECTRONIC CONTROL AND AMPLIFIER (PRESUMABLY MONOLITHIC), THE POSSIBILITY EXISTS, DUE TO THE CHARGE BEHAVIOR OF PIEZOELECTRICS, OF OPERATING WITHOUT EXTERNAL ELECTRONICS. THE GENERAL APPROACH TAKEN IN THIS PROPOSAL DOES NOT INCREASE THE COMPLEXITY OF FREQUENCY CONTROL BY THE CRYSTAL, NOR DOES IT REQUIRE COMPROMISE IN THE OSCILLATOR CRYSTAL CUT. THAT IS, IT AVOIDS POSSIBLE TECHNICAL PROBLEMS IN CRYSTAL DESIGN.

MANDEX INC  
8304D OLD COURT HOUSE RD  
VIENNA, VA 22180  
JOSEPH A FAULKNER

NAVY

\$ 49,938

TITLE:

ICE THICKNESS MEASUREMENT METHOD  
T 38 OFFICE: SPAWAR

THE PROPOSED CONCEPT FOR MEASURING ICE THICKNESS FROM A SUBMARINE IS FUNCTIONALLY SIMILAR TO THE BQS-15 IN THAT IT MEASURES THE HYDROSTATIC PRESSURE AT THE SUBMARINE AND THE UPWARD DISTANCE TO THE UNDERSURFACE OF THE ICE. THE PRESSURE IS DUE TO THE WEIGHT OF THE WATER COLUMN PLUS THAT OF THE ICE; SO, FROM THE TWO MEASUREMENTS, THE WEIGHT AND HENCE THE ICE THICKNESS CAN BE COMPUTED. HOWEVER, RATHER THAN USING AN UPWARD PING TO FIND THE DISTANCE TO THE ICE, WE PROPOSE TO USE THE RADIATED NOISE OF THE SUBMARINE BY CORRELATING THE REFLECTED NOISE WITH THE TRANSMITTED NOISE. PRELIMINARY CALCULATIONS INDICATE THAT IN THE ABSENCE OF LOUD ICE CRACKING NOISES OR PRESSURE RIDGES THIS RADIATED NOISE IS SUFFICIENTLY LOUD FOR THE PURPOSE. THE PROPOSED PHASE I EFFORT INVOLVES ACOUSTIC MODELING AND SIGNAL PROCESSING ANALYSIS. THE PRINCIPAL QUESTIONS TO BE ADDRESSED ARE THE EFFECT ON SYSTEM PERFORMANCE OF THE SPATIAL DISTRIBUTION OF NOISE SOURCES ON THE SUBMARINE, AMBIGUITIES GENERATED BY LINE COMPONENTS, THE PREVALENCE AND OPERATIONAL IMPORTANCE OF ICE CRACKING NOISES AND PRESSURE RIDGES, AND THE GENERAL CHARACTERISTICS OF THE ACOUSTIC REFLECTION COEFFICIENT OF THE ICE. WE WILL ALSO CONFIRM THAT THE SUBMARINE RADIATED NOISE IS SUFFICIENTLY LOUD.

FISCAL YEAR 1986

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MANDEX INC 8300 OLD COURT HOUSE RD VIENNA, VA 22180 CARL CAREY TITLE: FEASIBILITY STUDY TO PRODUCE A MILITARIZED TEMPEST-HARDENED LIGHT-WEIGHT PRINTER T 58 OFFICE: CECOM/AMSEL	ARMY	\$ 54,812

COMPUTERS HAVE PROLIFERATED THROUGHOUT THE ARMY AT A RAPID PACE AND ARE NOW COMMON DOWN TO THE BATTLEFIELD LEVEL. THE GROWTH OF POWERFUL, TEMPEST-HARDENED, PORTABLE COMPUTERS THAT HAS MADE THIS PROLIFERATION POSSIBLE BRINGS WITH IT THE NEED FOR EQUALLY PORTABLE, TEMPEST-HARDENED PRINTERS. THERE HAS BEEN GREAT PROGRESS IN PRODUCING SMALLER, FULL FEATURED, LIGHT-WEIGHT PRINTERS FOR THE COMMERCIAL MARKETPLACE. HOWEVER, THERE HAS BEEN LITTLE EFFORT EXPENDED IN MEETING THE REQUIREMENTS OF THE MILITARY IN THIS AREA. THIS PROPOSAL ADDRESSES THE PROBLEMS INVOLVED AND THE FEASIBILITY OF PRODUCING A MILITARIZED, TEMPEST-HARDENED, LIGHT-WEIGHT PRINTER WHICH FULFILLS THE SPECIFICATIONS LISTED IN THE SBIR SPECIFICATION A86-58. TWO APPROACHES ARE DISCUSSED: 1) MODIFYING AN EXISTING COMMERCIAL PRINTER, AND 2) DESIGNING A NEW PRINTER. THE OBJECTIVE OF THE PROPOSED EFFORT IS TO COMPLETE A PHASE I WORK PLAN, WHICH WHEN EXECUTED IN PHASE II, WILL PRODUCE THE DESIRED PRINTER. THE FINAL RESULT OF PHASE I WILL BE A DETAILED ENGINEERING PLAN FOR MODIFYING AN EXISTING PRINTER, OR A SET OF DETAILED PLANS FOR A PROPOSED NEW PROTOTYPE PRINTER DESIGNED ON THE BASIS OF THE PREVIOUS STEPS.

MANDEX INC 8304D OLD COURTHOUSE RD VIENNA, VA 22180 DAVID A COUTS TITLE: 3-D DIGITAL REPRESENTATION OF SOLID OBJECTS WITH MINIMUM HUMAN INTERVENTION T 167 OFFICE: NAVAIR/NTEC	NAVY	\$ 54,541
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THE PROPOSAL IS FOR DEVELOPMENT OF A NOVEL METHOD FOR ACQUIRING COMPLETE, ACCURATE, HIGH-RESOLUTION 3-D POSITION AND INTENSITY OR COLOR DATA FROM THE VISIBLE SURFACES OF SOLID OBJECTS. THE METHOD MAKES USE OF VIDEO (OR CCD) CAMERAS AND ACCOMPLISHES THE REQUIRE-

FISCAL YEAR 1986

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MENT THAT EVERY PIXEL IN THE CAMERA IMAGES OF AN OBJECT IS MAPPED INTO A 3-D DIGITAL MODEL. THE METHOD WILL MAKE USE OF INEXPENSIVE EQUIPMENT, AND ITS USE WILL REQUIRE MUCH LESS LABOR THAN METHODS THAT DEPEND ON MANUALLY TRACING DRAWINGS OR PHOTOGRAPHS. IT IS POTENTIALLY OPERABLE IN REAL TIME. THIS WILL ENABLE USERS TO MONITOR DATA ACQUISITION AND ENSURE THAT REQUIRED DATA ARE NOT INADVERTANTLY OMITTED.

MARITIME DYNAMICS INC RR 4 - BOX 424X LEXINGTON PARK, MD 20653 A W ERNEST TITLE: NAVY SURFACE EFFECT SHIP (SES) SEAKEEPING ASSESSMENT T 187 OFFICE: NSRDC	NAVY	\$ 57,858
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DEVELOPMENT OF A FREQUENCY-DOMAIN COMPUTER PROGRAM IS PROPOSED FOR PREDICTING STATISTICAL MOTION PARAMETERS (HEAVE, PITCH, AND ROLL DISPLACEMENTS, VELOCITIES, AND ACCELERATIONS) FOR VARIOUS SES CONFIGURATIONS AND DISPLACEMENTS UNDER VARIOUS OPERATING CONDITIONS-- WITH AND WITHOUT RIDE CONTROL. THE PHASE I TASKS WILL VERIFY THE FEASIBILITY OF USING A LINEAR FREQUENCY-DOMAIN APPROACH BY COMPARING INITIAL COMPUTER PROGRAM PREDICTIONS WITH AVAILABLE FULL SCALE (SES-200) TEST DATA.

MARKO MATERIALS INC PO BOX 3 NORTH BILLERICA, MA 01862 PETER J CLEMM TITLE: TITANIUM ALUMINIDE (Ti[3]Al) ALLOYS WITH IMPROVED HIGH TEMPERATURE STRENGTH VIA RAPID SOLIDIFICATION TECHNOLOGY T 158 OFFICE: AFWAL/ML	AF	\$ 50,000
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A SCREENING PROGRAM WILL BE CONDUCTED TO IDENTIFY NEW TITANIUM ALLOYS HAVING IMPROVED MECHANICAL PROPERTIES FROM ROOM TEMPERATURE TO 1400 DEG F. THESE ALLOYS WILL BE PRODUCED USING MARKO'S PROPRIETARY RAPID SOLIDIFICATION TECHNIQUE, FOLLOWED BY PULVERIZATION, CONSOLIDATION BY HOT ISOSATIC PRESSING AND EXTRUSION, AND THERMAL STABILIZATION. TWENTY-SIX COMPOSITIONS WILL BE STUDIED BASED ON THE INTER-

FISCAL YEAR 1986

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<p>METALLIC COMPOUNT Ti(3)Al STABILIZED WITH NIOBIUM AT 5 AND 15 ATOMIC PERCENT TO PRODUCE A SINGLE PHASE ALPHA, AS WELL AS A TWO PHASE (ALPHA + BETA) ORDERED STRUCTURE. TIN, ZIRCONIUM, AND HAFNIUM WILL BE ADDED TO DETERMINE THEIR EFFECT ON MICROSTRUCTURE AND DUCTILITY AS WELL AS VARIOUS LEVELS OF SILICON, BORON, CARBON, AND ERBIUM TO DETERMINE THEIR EFFECT ON DISPERSION STRENGTHENING AND GRAIN REFINEMENT. APPROPRIATE THERMAL STABILIZATION HEAT TREATMENTS WILL BE ESTABLISHED. MICROSTRUCTURAL EVALUATIONS WILL BE PERFORMED ON ALL ALLOYS IN THE AS-CAST, AS-EXTRUDED, AND THERMALLY STABILIZED CONDITION. SUFFICIENT QUANTITY (2 LBS) AT LEAST TWELVE ALLOYS WILL BE PRODUCED TO PERMIT TENSILE TESTING AT ROOM TEMPERATURE AND 1300 DEG F.</p>		

MARKO MATERIALS INC PO BOX 3 NORTH BILLERICA, MA 01862 RANJAN RAY TITLE: MANUFACTURING TECHNIQUE FOR HIGH TEMPERATURE COLUMBIUM-BASE ALLOYS T 104                      OFFICE: ASD/YZ	AF	\$	0
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ADVANCED COLUMBIUM ALLOYS HAVING IMPROVED HIGH TEMPERATURE MECHANICAL PROPERTIES AND OXIDATION RESISTANCE ARE OF LONG-TERM INTEREST TO THE U.S. AIR FORCE FOR POTENTIAL APPLICATIONS AS TURBINE VANES IN AIRCRAFT PROPULSION SYSTEMS. THERE IS AN OPPORTUNITY TO DEVELOP IMPROVED COLUMBIUM ALLOYS USING THE PRINCIPLES OF RAPID SOLIDIFICATION AND POWDER METALLURGY. MARKO MATERIALS HAS DEVELOPED A PROCESS AND BUILT THE NECESSARY EQUIPMENT TO FABRICATE HIGH MELTING REFRACTORY METAL ALLOYS AS RAPIDLY SOLIDIFIED POWDERS. THE OBJECTIVES OF THE PROPOSED PHASE I SBIR PROGRAM IS TO ESTABLISH THE BASIS OF A NEW MANUFACTURING TECHNOLOGY BASED ON RAPID SOLIDIFICATION PROCESSING WHICH WILL ENABLE FABRICATION OF NEW DISPERSION STRENGTHENED COLUMBIUM ALLOYS. SELECTED COLUMBIUM ALLOYS MODIFIED WITH BORON, CARBON, AND TITANIUM WILL BE PROCESSED AS RAPIDLY CAST RIBBONS ONTO A ROTATING CHILL SUBSTRATE USING MARKO'S REFRACTORY METAL RIBBON CASING EQUIPMENT. THE RIBBONS WILL BE PULVERIZED INTO POWDERS. POWDERS WILL BE CONSOLIDATED INTO BARS BY HOT EXTRUSION. CONSOLIDATED ALLOYS WILL BE EVALUATED FOR MICROSTRUCTURES AND TENSILE PROPERTIES AT ELEVATED TEMPERATURES.

FISCAL YEAR 1986

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MARTEK CORP 9115 GUILFORD RD COLUMBIA, MD 21046 DR DAVID J KYLE TITLE: BIODEUTERATION AND THE PRODUCTION OF PERDEUTERATED LUBRICANTS AND POLYMERS T 171 OFFICE: AFWAL/ML	AF	\$ 23,909

PERDEUTERATED SYNTHETIC OILS HAVE RECENTLY BEEN SHOWN TO EXHIBIT EXCEPTIONAL CHARACTERISTICS IN TERMS OF STABILITY TO HIGH TEMPERATURES AND OXIDIZING ENVIRONMENTS. IN SPITE OF THESE ADVANTAGES, THE HIGH COSTS OF CHEMICAL PERDEUTERATION HAVE RESTRICTED THE USE OF THESE COMPOUNDS TO CIRCUMSTANCES IN WHICH INSTRUMENT "DOWN-TIME" DUE TO LUBRICANT FAILURE IS VERY COSTLY OR A THREAT TO NATIONAL SECURITY. THIS PROPOSAL ADDRESSES THE FEASIBILITY OF A BIOTECHNOLOGICAL METHOD FOR PRODUCTION OF PERDEUTERATED OILS. THE OLEOGENIC MICROALGA NEO-CHLORIS OLEOABUNDANS WILL BE GROWN AUTOTROPHICALLY IN DEUTERIUM OXIDE. THE PERDEUTERATED BIO-OIL EXTRACTED FROM THESE ALGAE WILL BE USED AS A FEEDSTOCK FOR THE CHEMICAL PRODUCTION OF A PERDEUTERATED POLYOL ESTER LUBRICANT (PENTAERYTHRITOL TETRANONANOATE) AND A PERDEUTERATED POLYAMIDE, (NYLON-9). WE ANTICIPATE THAT THE REDUCED COSTS ASSOCIATED WITH THE DIODEUTERATION BY GROWTH OF OLEOGENIC MICROALGAE IN D20 COULD REDUCE THE COST (THEREBY INCREASE THE AVAILABILITY) OF THESE LUBRICANTS AND POLYMERS.

MARTIN ACOUSTICS SOFTWARE TECHNOLOGY 2627 BURGNER BLVD SAN DIEGO, CA 92110 G E MARTIN TITLE: PERSONAL COMPUTER AIDED ENGINEERING (PC CAE) OF UNDERWATER TRANSDUCERS AND ARRAYS T 178 OFFICE: NAVSEA/MPSC	NAVY	\$ 49,503
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NEW PC CAE CAN PROVIDE SIGNIFICANTLY IMPROVED R&D OF UNDERWATER ACOUSTIC TRANSDUCERS AND ARRAYS BY EXPLOITING CREATIVE NEW MATHEMATICAL MODELS AND OUTSTANDING, LOW-COST COMPUTER SYSTEMS. INNOVATIVE SOFTWARE WILL LEAD TO NEEDED IMPROVEMENTS IN PIEZOELECTRIC TRANSDUCER DESIGN AND MATERIAL-PARAMETER EVALUATIONS. MAST WILL INCLUDE ARRAY PERFORMANCE PROGRAMS OF IMPORTANT FORMS WITH SOLUTIONS OF

FISCAL YEAR 1986

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ELEMENT VELOCITIES, FOLLOWED BY BEAMFORMER AND SIGNAL-PROCESSING FUNCTIONS. IMPROVED MEASUREMENT TECHNIQUES WILL PROVIDE SUPERIOR CHARACTERIZATION OF MATERIALS, INCLUDING TROUBLESOME COMPLAINT MATERIALS. DEVELOPMENT OF PREPROGRAMMED, USER-FRIENDLY PC CAE UNITS WILL INCREASE INDIVIDUAL PRODUCTIVITY AND FACILITATE PERSONNEL TRAINING. INEXPENSIVE HIGH-CAPACITY DATA STORAGE UNITS MODIFY THE STRATEGY FROM VERSATILE GENERAL-PURPOSE CAE TO MANY SPECIAL-PURPOSE USER-FRIENDLY CAE SUBSYSTEMS. MANY OF THESE DEVELOPMENTS CAN BE ADAPTED TO OTHER USES SUCH AS ANALYSES OF ANTENNA ARRAYS, ACCOMPLISHED BY COMBINING PORTIONS OF PC CAE AS BASIC SOFTWARE COMPONENTS FOR ANY SYSTEM. PC CAE WILL HAVE UNLIMITED EXPANSION POSSIBILITIES BY USING CAREFULLY-DEFINED SUBROUTINES AS IN EISPACK, LINPACK, AND OTHER SOFTWARE LIBRARIES. NEW MODULES MAY BE ADDED AS IN AI SYSTEMS BY HAVING EXPERTS DESCRIBE THEIR DESIGN METHODS. THE SOFTWARE WILL PERMIT EXPERTS TO DEVELOP NEW SYSTEMS RAPIDLY, AND LESS-SKILLED PERSONS CAN PERFORM SUPERIOR DESIGNS.

MASSACHUSETTS TECHNOLOGY LAB (MTL) 312 AUSTIN AVE WEST NEWTON, MA 02165 DR DICKSON FANG TITLE: EM PROPAGATION IN IONIZED MEDIA - STATE OF THE ART ASSESSMENT T 47 OFFICE: CECOM/AMSEL	ARMY	\$ 51,980
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THE OBJECTIVES OF THE STUDY ARE (1) TO ASSESS THE PRESENT STATE OF KNOWLEDGE OF EM PROPAGATION IN IONIZED MEDIA AS IT PERTAINS TO THE NEEDS OF THE ARMY FOR REAL-TIME, RELIABLE, CONTINUOUS AND SURVIVABLE COMMUNICATIONS AND (2) TO IDENTIFY AND RECOMMEND THE TECHNICAL AREAS OF IONOSPHERIC PROPAGATION THAT REQUIRE FURTHER INVESTIGATION IN ORDER TO FULFILL THE ARMY'S PRESENT AND FUTURE COMMUNICATION REQUIREMENTS. THE STUDY INCLUDES NOT ONLY AN EVALUATION OF PROPAGATION PHENOMENA FOR RADIO WAVES AND MICROWAVES PER SE, BUT ALSO ANALYSES OF PROPAGATION-INDUCED SYSTEM DEGRADATIONS, ALL FOR THE ARMY'S COMMUNICATIONS OBJECTIVES UNDER THE ARMY 21 CONCEPT.

MATERIAL CONCEPTS INC 666 N HAGUE AVE COLUMBUS, OH 43204 JOSEPH A MOORE TITLE: FABRICATION OF MICROELECTRONIC PACKAGING MATERIALS T 150 OFFICE: AFWAL/ML	AF	\$ 48,847
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THE PROPOSED EFFORT WILL ESTABLISH THE FEASIBILITY OF PRODUCING

FISCAL YEAR 1986

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HOLLOW QUARTZ FILAMENT SUITABLE FOR USE AS REINFORCEMENT IN HIGH PERFORMANCE PRINTED WIRING BOARD APPLICATIONS. IF SUCCESSFUL THE EFFORT WILL PRODUCE AND FIBER SUITABLE FOR REINFORCING A POLYIMIDE RESIN SYSTEM WITH THE POTENTIAL OF POSSESSING A DIELECTRIC CONSTANT SUBSTANTIALLY LESS THAN 3.5 WITH A COEFFICIENT OF THERMAL EXPANSION MATCHING THAT OF CURRENT STATE-OF-THE-ART LEADLESS PERIMETER GRID ARRAY CERAMIC CHIP CARRIERS IN THE LAMINATE FORM. THIS WILL ALLOW INCREASED SIGNAL SPEED AND HIGH BOARD/COMPONENT ATTACHMENT RELIABILITY.

MATERIAL CONCEPTS INC  
666 N HAGUEAVE  
COLUMBUS, OH 43204  
DAVID M GODDARD

NAVY

\$ 50,000

## TITLE:

IMPROVED THERMAL AND MECHANICAL PROPERTIES OF MISSILE STRUCTURES  
THROUGH USE OF GRAPHITE FIBER REINFORCEMENT

T 55 OFFICE: NAVSEA

GRAPHITE FIBERS ARE AN EXTREMELY VERSATILE REINFORCEMENT MATERIAL, SINCE THEY ARE AVAILABLE IN BOTH HIGH-MODULUS AND HIGH-STRENGTH VARIETIES. WHEN COMBINED WITH A METAL MATRIX, THE RESULTANT COMPOSITE MATERIALS EXHIBIT EXCELLENT THERMAL AND MECHANICAL PROPERTIES. TO DATE, MOST GRAPHITE/METAL COMPOSITES HAVE UTILIZED ONLY THE HIGH-MODULUS FIBERS. THE OBJECTIVE OF THIS PROGRAM IS TO EXTEND THIS TECHNOLOGY TO INCLUDE NOT ONLY HIGH-STRENGTH GRAPHITE FIBERS, BUT ALSO HYBRID COMPOSITES CONTAINING BOTH HIGH-STRENGTH AND HIGH-MODULUS FIBERS. ESTABLISHED FIBER COATING AND CASTING TECHNIQUE FOR GRAPHITE/MAGNESIUM COMPOSITES, TOGETHER WITH A VARIETY OF HIGH-STRENGTH FIBERS AVAILABLE FROM SEVERAL MANUFACTURERS, WILL BE EMPLOYED TO PRODUCE MATERIALS WHICH EXHIBIT FULL TRANSLATION OF FIBER PROPERTIES. HYBRIDE MATERIALS WILL THEN BE CAST AND CHARACTERIZED, AND A DEMONSTRATION ARTICLE CONTAINING THE TWO FIBER TYPES WILL BE PRODUCED.

MATERIAL CONCEPTS INC  
666 N HAGUE AVE  
COLUMBUS, OH 43204  
WALTER R WHITMAN

NAVY

\$ 50,000

## TITLE:

CERAMIC REINFORCEMENT FOR METAL MATRIX COMPOSITES DEVELOPMENT

T 58 OFFICE: NAVSEA

RECENT DEVELOPMENTS IN THE AUTOMOTIVE INDUSTRY HAVE DEMONSTRATED THAT

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DISCONTINUOUS CERAMIC FIBER REINFORCEMENT CAN BE INCORPORATED IN A METAL MATRIX BY THE RELATIVELY SIMPLE AND INEXPENSIVE PROCESS OF SQUEEZE CASTING. THE OBJECTIVE OF THIS PROGRAM IS TO UPGRADE THIS TECHNOLOGY TO PRODUCE MATERIALS WHICH ARE FULLY, RATHER THAN SELECTIVELY, REINFORCED BY UP TO 20 VOLUME PERCENT DISCONTINUOUS FIBERS. HIGH PRESSURE CASTING APPARATUS WILL BE UTILIZED TO INCORPORATE OXIDE, GRAPHITE, AND SILICON CARBIDE FIBERS, INITIALLY PRESENT AS FIBER PERFORMS OR MATS, IN AN ALUMINUM ALLOY MATRIX. FLOW AND INFILTRATION CHARACTERISTICS OF THE MOLTEN MATRIX WILL BE STUDIED, AND THE RESULTANT COMPOSITE MATERIALS WILL BE CHARACTERIZED WITH RESPECT TO AMBIENT AND ELEVATED TEMPERATURE MECHANICAL PROPERTIES. SUITABILITY OF THE MATERIALS FOR OTHER THAN STRENGTH-RELATED APPLICATIONS WILL BE ASSESSED.

MATERIAL CONCEPTS INC  
666 N HAGUE AVE  
COLUMBUS, OH 43204  
RALPH F ORBAN

NAVY

\$ 50,000

TITLE:

INFRARED CAMOUFLAGE OF COMMAND AND CONTROL EQUIPMENT

T 17 OFFICE: USMC/LBC

MATERIAL CONCEPTS, INC. (MCI) PROPOSES TO DESIGN AND DEVELOP A NEW TYPE OF MILITARY CAMOUFLAGE WHICH WILL MASK INFRARED. THE NOVEL APPROACH INVOLVES A DUAL-COATED FABRIC MATERIAL WHICH HAS A PROPRIETARY REFLECTIVE METAL COATING ON THE HEAT-SONE SIDE AND A POLY-MERIC COATING IMPREGNATED WITH A LOW EMISSIVITY MATERIAL ON THE OPPOSITE SIDE. THE RESULTANT CAMOUFLAGE FABRIC WOULD BE FLEXIBLE, LIGHTWEIGHT, AMENABLE TO USE IN SEVERAL CAMOUFLAGE APPLICATIONS, AND COULD BE EASILY STORED, TRANSPORTED, AND APPLIED.

MATERIAL CONCEPTS INC  
666 N HAGUE AVE  
COLUMBUS, OH 43204  
JOSEPH A MOORE

NAVY

\$ 48,350

TITLE:

HIGHLY MACHINABLE FIBER FOR HIGH PERFORMANCE PWB REINFORCEMENT

T 143 OFFICE: NWSC

QUARTZ FIBER REINFORCED POLYIMIDE LAMINATES USED FOR HIGH DENSITY,



FISCAL YEAR 1986

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HIGH PERFORMANCE PWB APPLICATIONS SUFFER FROM THE POOR MACHINABILITY OF THE QUARTZ FIBER. DURING QUARTZ/POLYIMIDE PWB MANUFACTURE THOUSANDS OF HOLES MAY BE DRILLED. IF EXPENSIVE CARBIDE TOOLING IS REPLACED EVERY TEN "HITS", AS IS TYPICAL WITH QUARTZ REINFORCED PWBS, SIGNIFICANT COSTS ARE INVOLVED. THE OBJECTIVE OF THIS EFFORT IS TO ESTABLISH THE FEASIBILITY OF PRODUCING VYCOR FILAMENT POSSESSING ELECTRICAL AND CTE PROPERTIES VERY SIMILAR TO THOSE WHICH MAKE PURE QUARTZ SO ATTRACTIVE WHILE ADDING THE FEATURE OF INCREASED MACHINABILITY. THIS EFFORT WILL ESTABLISH FEASIBILITY OF DRAWING VYCOR MATERIAL INTO FINE FILAMENTS SUCH AS THOSE CURRENTLY USED FOR PWB MANUFACTURE; A FORM IN WHICH VYCOR IS CURRENTLY NOT AVAILABLE. THIS FIBER WILL THEN BE WOVEN INTO CLOTH AND FABRICATED INTO LAMINATES. KEY PROPERTIES (CTE, DIELECTRIC CONSTANT, AND MACHINABILITY) WILL BE COMPARED WITH THOSE OF PURE QUARTZ REINFORCED LAMINATES.

MATERIAL CONCEPTS, INC.

SDIO

\$ 50,000

666 NORTH HAGUE AVE.

COLUMBUS, OH 43204

WALTER R. WHITMAN

TITLE:

CAST GRAPHITE/MAGNESIUM COMPOSITES FOR HIGH ACCURACY POINTING DEVICES

T 11

OFFICE:

HIGH-ACCURACY POINTING DEVICES ARE CURRENTLY FABRICATED LARGELY FROM BERYLLIUM, A MATERIAL WHICH SUFFERS FROM TOXICITY AND COST PROBLEMS. Gr/Mg COMPOSITES CONTAINING P120 (120 Msi MODULUS) FIBERS CAN POTENTIALLY REPLACE BERYLLIUM IN MANY APPLICATIONS. IF THESE MATERIALS CAN BE DIRECTLY CAST TO NEAR NET SHAPE, THEY OFFER A COST BENEFIT AS WELL. THE OBJECTIVE OF THIS PROJECT IS TO CAST P120/Mg COMPOSITES AND TO VERIFY THAT THE PROPERTIES OF THESE MATERIALS FOLLOW THEORETICALLY PREDICTED BEHAVIOR. THIS TECHNOLOGY WILL BE BASED ON PREVIOUSLY ESTABLISHED PROCEDURES FOR CASTING Gr/Mg COMPOSITES CONTAINING LOWER MODULUS FIBERS, WITH APPROPRIATE MODIFICATIONS FOR THE HANDLING AND WETTING CHARACTERISTICS OF THE NEW FIBERS. MECHANICAL AND THERMAL EXPANSION TESTING OF P120/Mg MATERIALS OF DIFFERENT FIBER CONTENTS AND ORIENTATIONS WILL ESTABLISH THE RANGE OF THESE PROPERTIES. ALSO, FATIGUE AND DAMPING STUDIES WILL BE CONDUCTED.

MATERIALS &amp; ELECTRO-CHEMICAL RSCH CORP

AF

\$ 62,000

4660 N VIA MADRE

TUCSON, AZ 85749

TITLE:

CERAMIC COMPOSITE INSULATING RAILS FOR ELECTROMAGNETIC GUNS

T 24

OFFICE: AFATL/SAS

THERE IS A GREAT DEMAND IN SPACE, DEFENSE, AND COMMERCIAL APPLICA-

FISCAL YEAR 1986

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TIONS FOR A HIGH TEMPERATURE OXIDATION-RESISTANT, LIGHTWEIGHT, HIGH MODULUS, AND HIGH STRENGTH CERAMIC COMPOSITE WITH EXCEPTIONAL HIGH STATIC AND DYNAMIC TOUGHNESS. TOUGHENING AND STRENGTHENING BY PHASE TRANSFORMATION AND WHISKER REINFORCEMENT HAS BEEN DEMONSTRATED BUT NOT COLLECTIVELY IN THE SAME COMPOSITE. THE FULL POTENTIAL OF THESE TOUGHENING/STRENGTHENING MECHANISMS HAS NOT BEEN ACHIEVED BY THE TRADITIONAL ROUTE OF COMBINING POWDERS AND CONSOLIDATING. UTILIZING SOL-GEL TECHNOLOGY TO PRODUCE A FINE-GRAINED ALUMINA MATRIX AND PRECIPITATING THE  $ZrO(2)/HfO(2)$  ONTO THE ALUMINA AT THE GRAIN BOUNDARIES COMBINED WITH THE ADDITION OF WHISKERS IS AN INNOVATIVE APPROACH TO PRODUCE A COMBINATION COMPOSITE WITH SUBSTANTIALLY IMPROVED TOUGHNESS, STRENGTH, AND OXIDATION RESISTANCE OF 1600 DEG C OR ABOVE. CONSOLIDATION AT HIGH TEMPERATURES TO ACHIEVE THE TETRAGONAL PHASE IN  $ZrO(2)/HfO(2)$  WILL BE ACCOMPLISHED WITH RAPID MICROWAVE SINTERING TO PRODUCE A NEAR THEORETICAL DENSE COMPOSITE WITH MINIMUM GRAIN GROWTH AND THE MINIMUM NUMBER AND SIZE FLAWS. THIS PROGRAM UTILIZES UNIQUE SOL-GEL TECHNOLOGY AND A STATISTICALLY DESIGNED EXPERIMENTAL PROGRAM TO PRODUCE AN ALUMINA MATRIX COMPOSITE WITH A MULTITUDE OF USES IN ADVANCED STRUCTURES SUCH AS IN SPACE MISSION APPLICATIONS, PROPULSION SYSTEMS INCLUDING HEAT ENGINES, AND IN ELECTROMAGNETIC STRUCTURES SUCH AS INSULATING RAILS FOR ELECTROMAGNETIC GUNS.

MATERIALS & ELECTROCHEMICAL RESEARCH	SDIO	\$ 50,000
4660 N. VIA MADRE		
TUCSON, AZ 85749		
J. C. WITHERS, PHD		
TITLE:		
CERAMIC COMPOSITE MATERIAL FOR SPACE STRUCTURES		
T 11	OFFICE:	

THERE IS A GREAT DEMAND IN SPACE, DEFENSE, AND COMMERCIAL APPLICATIONS FOR A HIGH TEMPERATURE OXIDATION-RESISTANT, LIGHTWEIGHT, HIGH MODULUS, AND HIGH STRENGTH CERAMIC COMPOSITE WITH EXCEPTIONAL HIGH STATIC AND DYNAMIC TOUGHNESS. TOUGHENING AND STRENGTHENING BY PHASE TRANSFORMATION AND WHISKER REINFORCEMENT HAS BEEN DEMONSTRATED BUT NOT COLLECTIVELY IN THE SAME COMPOSITE. THE FULL POTENTIAL OF THESE TOUGHENING/STRENGTHENING MECHANISMS HAS NOT BEEN ACHIEVED BY THE TRADITIONAL ROUTE OF COMBINING POWDERS AND CONSOLIDATING. UTILIZING SOL-GEL TECHNOLOGY TO PRODUCE A FINE-GRAINED ALUMINA MATRIX AND PRECIPITATING THE  $ZrO(2)/HfO(2)$  ONTO THE ALUMINA AT THE GRAIN BOUNDARIES COMBINED WITH THE ADDITION OF WHISKERS IN AN INNOVATIVE APPROACH TO

FISCAL YEAR 1986

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<p>PRODUCE A COMBINATION COMPOSITE WITH SUBSTANTIALLY IMPROVED TOUGHNESS, STRENGTH, AND OXIDATION RESISTANCE OF 1600 DEG C OR ABOVE. CONSOLIDATION AT HIGH TEMPERATURES TO ACHIEVE THE TETRAGONAL PHASE IN <math>ZrO(2)/HfO(2)</math> WILL BE ACCOMPLISHED WITH RAPID MICROWAVE SINTERING TO PRODUCE A NEAR THEORETICAL DENSE COMPOSITE WITH MINIMUM GRAIN GROWTH AND THE MINIMUM NUMBER AND SIZE FLAWS. THIS PROGRAM UTILIZES UNIQUE SOL-GEL TECHNOLOGY AND A STATISTICALLY DESIGNED EXPERIMENTAL PROGRAM TO PRODUCE AN ALUMINA MATRIX COMPOSITE WITH A MULTITUDE OF USES IN ADVANCED STRUCTURES SUCH AS IN SPACE MISSION APPLICATIONS, PROPULSION SYSTEMS INCLUDING HEAT ENGINES, AND IN ELECTROMAGNETIC STRUCTURES SUCH AS INSULATING RAILS FOR ELECTROMAGNETIC GUNS.</p>		

MATERIALS ANALYSIS INC 10338 MILLER RD DALLAS, TX 75238 EDWARD P COX TITLE: WELDING BRUSH CLEANING AND WELD CONTAMINATION EVALUTION T 102 OFFICE: BRDC	ARMY	\$ 39,820
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LITTLE TECHNICAL INFORMATION HAS BEEN PUBLISHED ON THE EFFECT OF DIFFERENT WELD BRUSH DESIGNS AND MATERIALS ON WELD QUALITY. A NEED THEREFORE EXISTS TO QUANTIFY THE EFFICIENCY OF VARIOUS BRUSH MATERIALS TO REMOVE SURFACE CONTAMINANTS AND THE EFFECT OF BRUSH DEBRIS ON THE QUALITY OF THE WELD. PHASE I OF THIS PROPOSAL CONSISTS OF CONTROLLED TEST PROCEDURES TO EVALUATE AND QUANTIFY ROTARY BRUSH MATERIALS ON SURFACE CLEANING, FIBER DURABILITY, AND WELD QUALITY. THE RESULTS OF THE PHASE I EFFORT WOULD BE A BEST-TO-WORST RANKING OF 10 TO 15 ROTARY BRUSHES AND DEVELOPMENT OF WELDING BRUSH TEST METHODS. PHASE II WOULD CONSIST OF EXPANDED TESTING OF BRUSH CONFIGURATIONS AND FIBER MATERIALS, AND PUBLICATION OF A PRODUCT (PURCHASING) SPECIFICATION FOR WELDING BRUSHES. THE RESULTS OF THIS WORK WOULD BE A RANKING OF BRUSHES BASED ON CONFIGURATION AND MANUFACTURER. PHASE II WOULD ALSO ESTABLISH STANDARDIZED TESTING PROCEDURES AND PERFORMANCE-BASED PURCHASE SPECIFICATIONS.

MATERIALS INNOVATION LABS 7384 A TRADE ST SAN DIEGO, CA 92121 KENNETH H HOLKO TITLE: JOINING METHODS FOR CARBON-CARBON STRUCTURES T 124 OFFICE: AFWAL/FI	AF	\$ 49,581
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HIGH TEMPERATURE (2500 DEG F) AIRFRAMES ARE NEEDED FOR HYPERSONIC

FISCAL YEAR 1986

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MISSILES. A CARBON/CARBON COMPOSITE MATERIAL IS ATTRACTIVE FOR THIS APPLICATION. JOINING TECHNIQUES ARE REQUIRED THAT CAN BE APPLIED TO AIRFRAME FABRICATION THAT WILL PERFORM AT HIGH TEMPERATURES. SINCE MOST JOINING WORK TO DATE HAS CENTERED ON LOWER TEMPERATURE JOINING METHODS AND MATERIALS, A RESEARCH EFFORT IS NEEDED TO IDENTIFY AND APPLY NEW AND PROMISING JOINING TECHNIQUES. IN PHASE I LITERATURE AND RESEARCHERS IN CARBON/CARBON COMPOSITE, GRAPHITE AND OTHER MATERIAL JOINING WILL BE SURVEYED AND ASSESSED. THIS WILL BE ACCOMPANIED BY EXPERIMENTATION WITH SPECIAL SURFACE PREPARATION TECHNIQUES FOLLOWED BY SUITABLE JOINING EXPERIMENTATION. METALLURGICAL EVALUATION WILL BE MADE OF EXPERIMENTAL JOINTS AND RESULTS COMPARED WITH AND WITHOUT SPECIAL SURFACE PREPARATION. A REPORT WILL DESCRIBE THE ASSESSMENTS MADE AND EXPERIMENTAL RESULTS. A PHASE II PROGRAM WILL BE DESCRIBED WHICH WILL DETAIL PROMISING JOINING METHODS TO BE USED FOR DESIGN, FABRICATION, AND TESTING OF REPRESENTATIVE STRUCTURAL JOINTS.

MATERIALS MODIFICATION INC  
10195 MAIN ST - STE K  
FAIRFAX, VA 22031  
DR T S SRIVATSAN  
TITLE:

NAVY

\$ 49,863

PORTABLE IMPULSE MEASUREMENTS TO NONDESTRUCTIVE PREDICT INTEGRITY  
OF ADHESIVE JOINTS

T 116 OFFICE: NSWC

INHOMOGENEITIES AND/OR DEGRADATION IN ENGINEERING MATERIALS, PARTICULARLY ADHESIVE JOINTS, PRESENTS AN AREA OF CONSTANT AGGRAVATION TO BOTH DESIGNERS AND MANUFACTURERS. PREVIOUS RESEARCH HAS SHOWN THAT THE RESPONSE OF STRUCTURAL COMPONENTS TO IMPOSE VIBRATIONS CAN BE USED TO CHARACTERIZE THEIR INTEGRITY. THIS PROPOSAL OUTLINES A RESEARCH PROGRAM TO EXPLORE THE POSSIBILITY OF USING THE PREVIOUSLY DEVELOPED IMPULSE FREQUENCY RESPONSE VIBRATION TECHNIQUE AS A MECHANISTIC TOOL FOR EVALUATION OF THE STRUCTURAL INTEGRITY OF ADHESIVE BONDED JOINTS. PHASE I OF THE PROGRAM WOULD BE A FEASIBILITY STUDY TO VALIDATE THE VIBRATION INDUCED RESPONSE IN A MATERIAL WILL PROVIDE A PRACTICAL MEANS OF APPLYING MECHANICAL STRESSES THROUGH SMALL AMPLITUDE VIBRATION AND EVALUATING THEIR EFFECTS ON ADHESIVE BOND INTERFACES. THE TECHNIQUE HAS THE POTENTIAL FOR USING DURING MANUFACTURE (BY SETTING "ACCEPT-REJECT" LIMITS IN THE QUALITY OR PROCESS CONTROL OPERATIONS) AND FOR MONITORING DEGRADATION DURING THE SERVICE

FISCAL YEAR 1986

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LIFE OF ADHESIVE JOINTS. THE UTILITY AND SIMPLICITY OF THIS APPROACH IS A DEFINITE ASSET FOR FULFILLING THE DEMANDS OF A NON-DESTRUCTIVE IN-SITU TEST TECHNIQUE IN VARIOUS APPLICATIONS.

MATERIALS RELIABILITY INC N WASHINGTON @ E-W TOLLWAY NAPERVILLE, IL 60566 J S SANTNER TITLE: MATRIX ALLOY DESIGN FOR TOUGHENING DISCONTINUOUSLY REINFORCED COMPOSITES T 111	NAVY	\$ 49,459
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OFFICE: NSWC

CURRENT ALUMINUM MATRIX COMPOSITES WHICH USE ALLOYS REQUIRING SOLUTION HEAT TREATING, QUENCHING, AND ELEVATED TEMPERATURE AGING SUFFER FROM POOR TOUGHNESS. IT IS EXPECTED THE TOUGHNESS OF ALUMINUM MATRIX COMPOSITES CAN BE SIGNIFICANTLY INCREASED THROUGH THE USE OF 5000 SERIES ALLOYS WHICH HAVE HIGH WORK HARDENING RATES AND GOOD DUCTILITY. ANY LOSS IN COMPOSITE STRENGTH CAN BE COMPENSATED BY ADJUSTING THE VOLUME FRACTION OF THE SIC PARTICULATE. THE RESULTING COMBINATION OF COMPOSITE STRENGTH AND TOUGHNESS SHOULD BE ENHANCED OVER CURRENT COMPOSITES. OTHER ADVANTAGES OF A 5000 SERIES ALLOY MATRIX INCLUDE: TOUGHNESS IS LESS SENSITIVE TO PURITY LEVEL, RESIDUAL STRESSES FROM QUENCHING ARE ELIMINATED, AND THE COMPOSITES ARE AMENIABLE TO LOW COST CASTING TECHNIQUES TO PRODUCE AS CAST COMPLEX SHAPES OR BILLETS FOR SUBSEQUENT HOT WORKING. MICRO-DEFORMATION STUDIES AS A FUNCTION OF THE CRACK OPENING DISPLACEMENT AND VOLUME FRACTION OF REINFORCEMENT WILL PROVIDE INSIGHT FOR ALLOY DEVELOPMENT.

MATERIALS RESEARCH & COMPUTER SIMULATION 4561 CAMINO MOLINERO SANTA BARBARA, CA 93110 DR WILLIAM OLDFIELD TITLE: CASTING DEVELOPMENT BY COMPUTER MODELING T 176	NAVY	\$ 50,000
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OFFICE: NAVAIR/NAPC

THIS PROJECT IS DESIGNED TO PROVIDE A TOOL TO IMPROVE THE QUALITY OF CASTINGS PRIMARILY BY CONTROL OF MICROSHRINKAGE. IT WILL HAVE TWO OBJECTIVES; (a) IMPROVE THE QUALITY OF COMPONENTS CURRENTLY PRODUCED

FISCAL YEAR 1986

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<p>BY CASTING, AND (b) FACILITATE THE APPLICATION OF CASTING METHODS TO OTHER COMPONENTS THUS REDUCING COSTS. WE PROPOSE TO ACHIEVE THESE OBJECTIVES BY DEVELOPING A COMPUTER MODEL FOR THE CASTING PROCESS WHICH PREDICTS MICROPOROSITY FORMATION. THE MAIN TASK ADDRESSED IN THIS PROPOSAL IS THE DETAILED TREATMENT OF THE METALLURGICAL FEATURES OF SOLIDIFICATION. THE MODEL WILL HAVE THE ABILITY TO PREDICT THE DEPTH OF THE FREEZING INTERFACE, THE FINENESS OF THE GROWING DENDRITES, AND THE PARTITIONING OF DISSOLVED GAS, AND WILL COMPUTE FLUID FLOW NEAR THE ADVANCING SOLID-LIQUID INTERFACE. HENCE, WE WILL PREDICT THE POSITION AND SIZE OF VOIDS FORMED DURING FREEZING. THE RESULTS WILL BE COMPARED WITH OBSERVATIONS. BY ADDING A MORE DETAILED HEAT FLOW TREATMENT (IN TASK III BUT MAINLY IN PHASE II), COUPLED WITH PRACTICAL EXPERIENCE AND SOME EXPERIMENTATION THE MODEL COULD BE READILY EXTENDED TO MORE COMPLEX CASTIG SHAPES.</p>		

MATERIALS SCIENCES CORP GWYNEDD PLAZA II - BETHLEHEM PIKE SPRING HOUSE, PA 19477 SAILENDRA N CHATTERJEE TITLE: EFFECT OF SURFACE CUTS ON MOTOR CASE STRENGTH - ANALYTICAL MODEL T 246                      OFFICE: BMO/MYSC	AF	\$ 49,810
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MODELING WILL BE PERFORMED FOR (i) EFFECTS OF ANISOTROPY AND NON-HOMOGENEITY ON THE THREE-DIMENSIONAL STRESS FIELD NEAR SHALLOW SURFACE CUTS IN THICK LAMINATES FOR THE PREDICTION OF FIRST LIGAMENT FAILURE; AND (ii) GROWTH OF DELAMINATIONS NEAR SURFACE FLAWS IN LAMINATED PLATES AND SHELLS UNDER QUASI-THREE-DIMENSIONAL STRESS STATES FOR OBTAINING FINAL FAILURE LOADS. RESULTS OF FINITE ELEMENT SOLUTIONS, APPROXIMATE FORMULATIONS AND AVAILABLE TEST DATA WILL BE COMPARED AND A COMPREHENSIVE TEST PLAN WILL BE FORMULATED. TESTS, MODEL REFINEMENTS, AND ADDITIONAL DATA CORRELATION STUDIES ARE PROPOSED IN THE FOLLOWING PHASES. THE MAIN OBJECTIVE IN PHASE I IS TO EXAMINE THE FEASIBILITY OF THE ANALYTICAL MODELING APPROACH AND ITS VALIDITY.

MATERIALS SCIENCES CORP GWYNEDD PLAZA II - BETHLEHEM PIKE SPRING HOUSE, PA 19477 FRANK J SCHWAN TITLE: LIGHT WEIGHT COMPOSITE ROADWAY SURFACING SYSTEM - PRELIMINARY DESIGN T 97                      OFFICE: BRDC	ARMY	\$ 50,000
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THE OBJECTIVE OF THIS PHASE I STUDY IS TO ESTABLISH THE FEASIBILITY

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>OF DESIGNING AND FABRICATING A ROADWAY SURFACING SYSTEM OF COMPOSITE MATERIALS. THE STUDY WILL BE CONDUCTED IN SEVERAL STEPS. PRELIMINARY DESIGN TRADEOFF STUDIES WILL IDENTIFY THE BEST MATERIALS AND GEOMETRIC CONFIGURATIONS. FABRICATION CONSIDERATIONS AND COST EFFECTIVENESS WILL BE EVALUATED IN ORDER TO IDENTIFY THE ONE OR TWO MOST PROMISING CONFIGURATIONS. EFFECTS OF MOISTURE ABSORPTION AND SURFACE WEAR ON THE LIFE OF THE COMPONENT WILL BE ESTIMATED FROM EXISTING DATA. A TEST PLAN ENCOMPASSING REQUIRED DESIGN ALLOWABLES, CRITICAL DURABILITY PARAMETERS AND ENVIRONMENTAL EFFECTS WILL BE FORMULATED. CONCEPTUAL DESIGN OF HINGE CONNECTORS AND OTHER JOINTS WILL BE PERFORMED FOR THE SELECTED CONFIGURATION.</p>		

MATERIALS SCIENCES CORP GWYNEDD PLAZA II - BETHLEHEM PIKE SPRING HOUSE, PA 19477 SAILENDRA N CHATTERJEE TITLE: FRACTURE TOUGHNESS CHARACTERIZATION OF FILIMENTARY METAL MATRIX COMPOSITE MATERIALS SYSTEMS T 144 OFFICE: NWSC	NAVY	\$ 49,860
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AN ATTEMPT WILL BE MADE TO CHARACTERIZE FRACTURE BEHAVIOR AND TOUGHNESS OF SELECTED METAL MATRIX SYSTEMS WITH THE HELP OF (i) SEMI-EMPIRICAL METHODS AND ELASTIC ANALYSES DEVELOPED OVER THE LAST DECADE FOR LAMINATED SYSTEMS WHERE PLASTIC ZONE SIZE IS SMALL, (ii) ACCURATE AND APPROXIMATE ELASTOPLASTIC STRESS ANALYSES WITH DUE CONSIDERATION TO ANISOTROPY AND INHOMOGENEITY AS WELL AS FRACTURE CHARACTERIZATION CONCEPTS LIKE CRITICAL ENERGY RELEASE RATES, UNSTABLE GROWTH OF PLASTIC ZONE, FIBER STRESS AHEAD OF THE NOTCH TIP, ETC. FOR UNIDIRECTIONAL AND CROSS-PLY MATERIALS, WHERE PLASTIC ZONE SIZE AND SPECIMEN GEOMETRY PLAY AN IMPORTANT ROLE, (iii) AN EXPERIMENTAL STUDY ON UNIDIRECTIONAL SiC/Al MATERIAL FOR DETERMINING PLASTIC ZONE SIZE, EFFECT OF MATRIX PLASTICITY, CHARACTERIZATIONS OF FRACTURE, (iv) CLASSIFICATION OF AVAILABLE DATA BASED ON MATERIAL AND TYPE OF FAILURE AND, (v) DATA CORRELATION STUDIES. FRACTURE AND/OR CRACKING PARALLEL TO FIBERS AND ITS REASONS WILL ALSO BE INVESTIGATED. SUITABLE FRACTURE TOUGHNESS CHARACTERIZATION CONCEPTS WILL BE SELECTED.

MATERIALS SCIENCES INC GWYNEDD PLAZA II - BETHLEHEM PIKE SPRING HOUSE, PA 19477 EDWARD A HUMPHREYS TITLE: IMPROVED THERMAL AND MECHANICAL PROPERTIES OF COMPOSITES T 55 OFFICE: NAVSEA	NAVY	\$ 49,800
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CURRENT CARBON FIBERS EXIST WITH MODULI UP TO 140 msi OR STRENGTHS

FISCAL YEAR 1986

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APPROACHING 1 msi. THESE TWO EXCEPTIONAL PROPERTIES DO NOT EXIST SIMULTANEOUSLY WITHIN ANY FIBER HOWEVER. TYPICALLY, HIGH MODULUS FIBERS EXHIBIT LOW STRENGTH WHILE HIGH STRENGTH FIBERS EXHIBIT LOW MODULUS. THE THRUST OF THE PROPOSED PROGRAM IS TO DETERMINE THE RANGE OF THERMAL AND MECHANICAL PROPERTIES AVAILABLE THROUGH HYBRIDIZATION. THE PROPOSED EFFORT WILL EVALUATE ANALYTICALLY THE RANGE OF PROPERTIES AVAILABLE THROUGH TWO HYBRIDIZATION SCHEMES. FIRST, HIGH MODULUS AND HIGH STRENGTH FIBERS WILL BE COMBINED IN A SINGLE PLY. SECOND, PLYS REINFORCED WITH HIGH MODULUS FIBERS WILL BE COMBINED IN A LAMINATE WITH PLYS REINFORCED WITH HIGH STRENGTH FIBERS. WITHIN THE ANALYSIS, POLYMERIC, CARBON, AND METALLIC MATERIALS WILL BE UTILIZED AS THE COMPOSITE MATRIX MATERIAL. THE RESULTS OF THESE EFFORTS WILL QUANTIFY THE RANGE OF PROPERTIES AVAILABLE THROUGH HYBRIDIZATION.

MATERIALS SCIENCES INC  
GWYNEDD PLAZA II - BETHLEHEM PIKE  
SPRING HOUSE, PA 19477  
JOHN J KIBLER

NAVY

\$ 50,000

## TITLE:

MATERIAL FOR JOINING OF THERMALLY MIS-MATCHED COMPONENTS FOR HIGH VELOCITY MISSILES

T 56

OFFICE: NAVSEA

THIS PROGRAM WILL DEVELOP A MATERIAL SPECIFICALLY FOR JOINING HIGHLY MIS-MATCHED MATERIALS FOR HIGH VELOCITY MISSILES. IT WILL BE DEMONSTRATED THAT GRAPHITE FIBER REINFORCED METAL MATRIX COMPOSITE MATERIALS CAN BE PRODUCED WITH TAILORABLE THERMAL EXPANSION PROPERTIES WITHIN A PANEL. A MATERIAL WHICH HAS VERY LOW THERMAL EXPANSION CHARACTERISTICS AT ONE EDGE, WHILE POSSESSING THERMAL EXPANSION CHARACTERISTICS COMPATIBLE WITH A METAL AT THE OPPOSITE END WILL BE DESIGNED. IT IS A WELL KNOWN FACT THAT GRAPHITE FIBER REINFORCED METAL MATRIX MATERIAL CAN BE PRODUCED WHICH WILL POSSESS ZERO OR VERY NEAR ZERO THERMAL EXPANSION. THIS PROGRAM WILL USE ANALYTICAL MODELING TO DESIGN COMPOSITE MATERIALS WITH CERAMIC LIKE EXPANSION PROPERTIES AND METAL LIKE EXPANSIONS. A WEAVE WILL THEN BE DESIGNED WHICH WILL BE A TRANSITION BETWEEN THESE TWO REINFORCEMENT GEOMETRIES. A SAMPLE OF THE RESULTING MATERIAL WILL BE FABRICATED AND DENSIFIED WITH COPPER TO DEMONSTRATE THAT TAILORED THERMAL EXPANSIONS CAN BE BOTH DESIGNED AND FABRICATED. THE RESULTING MATERIAL WILL FORM THE BASELINE FOR A CLASS OF COMPOSITE MATERIALS SPECIFICALLY



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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DESIGNED FOR ACCOMMODATING THE THERMAL EXPANSION MIS-MATCHES WHICH  
EXIST BETWEEN HIGH TEMPERATURE CERAMICS AND METALS.

MATERIALS SCIENCES INC GWYNEDD PLAZA II - BETHLEHEM PIKE SPRING HOUSE, PA 19477 DAVID G TAGGART TITLE: DEVELOPMENT OF ELASTIC-PLASTIC CONSTITUTIVE RELATIONS FOR WHISKER REINFORCED METAL MATERIALS T 144 OFFICE: NWSC	NAVY	\$ 49,990
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WHISKER REINFORCED METAL MATERIALS EXHIBIT STRENGTHS AND STIFFNESSES CONSIDERABLY HIGHER THAN THOSE OBSERVED IN CORRESPONDING UNREINFORCED ALLOYS. THESE ENHANCED PROPERTIES ARE OFTEN ACCOMPANIED BY REDUCED DUCTILITY. IN ORDER THAT THESE MECHANICAL PROPERTIES BE CONTROLLED AND IMPROVED REQUIRES A FUNDAMENTAL UNDERSTANDING AS TO HOW CONSTITUENT PROPERTIES AND GEOMETRIC CONFIGURATIONS EFFECT THE COMPOSITE PROPERTIES. SINCE THE DUCTILITY IS CRITICAL TO THE SUCCESSFUL USE OF THESE MATERIALS IN MANY STRUCTURAL APPLICATIONS, THE UNDERSTANDING MUST INCLUDE THE PLASTIC DEFORMATION BEHAVIOR. THE OBJECTIVE OF THE PROPOSED RESEARCH PROGRAM IS TO DEVELOP AN ANALYTIC MODELING APPROACH FOR THE ELASTIC-PLASTIC DEFORMATION BEHAVIOR OF WHISKER REINFORCED METALS. THIS PROGRAM WILL INCLUDE THE DEVELOPMENT OF APPROPRIATE MATRIX CONSTITUTIVE RELATIONS FOR INPUT TO THE MODEL, AN EVALUATION OF POTENTIAL APPROACHES TO THE ANALYSIS OF THESE MATERIALS, THE IDENTIFICATION OF AN APPROPRIATE MODELING APPROACH, THE GENERATION OF EXPERIMENTAL DATA FOR SiC/ALUMINUM MATERIALS, AND A COMPARISON OF THE ANALYTIC PREDICTIONS TO THE EXPERIMENTAL DATA. THE RESULTS OF THESE TASKS WILL LEAD TO AN ACCURATE MODELING APPROACH FOR THE ANALYSIS OF THESE MATERIALS. THIS MODEL WILL PROVIDE GUIDANCE TO BOTH MATERIAL SUPPLIERS IN DEVELOPING IMPROVED MATERIALS AND STRUCTURAL DESIGNERS IN DESIGNING COMPONENTS WHICH UTILIZE THESE MATERIALS.

MAXDEM INC 267 S FAIR OAKS AVE PASADENA, CA 91105 DR JORGE SOTO TITLE: NEW PREPARATIVE TECHNIQUES FOR CARBON/CARBON COMPOSITES T 10 OFFICE: DARPA	DARPA	\$ 61,389
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THIS PROJECT WILL SEEK TO DEVELOP NEW METHODOLOGY FOR THE PREPARATION

FISCAL YEAR 1986

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<p>OF CARBON/CARBON (C/C) COMPOSITES. THESE COMPOSITES CAN WITHSTAND USE TEMPERATURES OF 700 DEG F OR HIGHER; IN BRAKING APPLICATIONS TEMPERATURES CAN REACH 1000 DEG F OR MORE WITHOUT FAILURE. CURRENT TECHNIQUES REQUIRE TREATNG CARBON FIBERS WITH GASEOUS HYDROCARBONS AT HIGH PRESSURES AND ELEVATED TEMPERATURES. THE OBJECTIVE METHOD WILL EMPLOY POLYMERIC MATERIALS WHICH ARE EXPECTED TO PERMIT LOW PRESSURE CONDITIONS FOR CURING, AND WILL MINIMIZE THE EVOLUTION OF DELETERIOUS VOLATILES. TO DEMONSTRATE THE FEASIBILITY OF THE APPROACH PHASE I WILL FOCUS ON SYNTHESIS, INCLUDING STUDIES OF A RANGE OF STARTING MATERIALS AND TREATMENT CONDITIONS. PRODUCTS WILL BE SUBJECTED TO FULL CHEMICAL ANALYSIS AND SOME OF THEIR PHYSICO-MECHANICAL PROPERTIES WILL BE MEASURED.</p>		

MAXIM TECHNOLOGIES INC 3930 FREEDOM CIRCLE - STE A SANTA CLARA, CA 95054 JOHN R CONKLE TITLE: DEDICATED PERIPHERAL FOR ENHANCED MINIMUM EXECUTION DEVELOPMENT	NAVY	\$ 49,971
T 32	OFFICE: SPAWAR	

THE MINIMUM ALGORITHM HAS BEEN USED VERY SUCCESSFULLY AS A PREDICTIVE TOOL FOR DETERMINING THE MUF OF AN HF CIRCUIT. THE ALGORITHM IS CURRENTLY IMPLEMENTED AS A BASIC PROGRAM. THE USEFULNESS OF THIS ALGORITHM WOULD BE GREATLY ENHANCED IF THE ALGORITHM COULD BE IMPLEMENTED SUCH THAT A TIME, FREQUENCY PAIR CALCULATION COULD BE COMPLETED IN 1 ms (GOAL). THIS PROPOSAL PRESENTS AN ANALYSIS AND PRELIMINARY HARDWARE AND SOFTWARE DESIGN TO ENHANCE THE SPEED OF THE MINIMUM ALGORITHM. THE APPROACH UTILIZES A DEDICATED PERIPHERAL CARD WHICH OCCUPIES AN EXPANSION SLOT OF AN IBM PC OR COMPATIBLE COMPUTER. THE HARDWARE UTILIZES AN 8086 MICROPROCESSOR AND AN 8087 MATH CO-PROCESSOR WITH THE SOFTWARE WRITTEN IN ASSEMBLY LANGUAGE. COMPUTATION SPEEDS APPROACHING 3 ms ARE EXPECTED USING THIS APPROACH.

MAYFLOWER COMMUNICATIONS CO INC 384 LOWELL ST - STE 105 A WAKEFIELD, MA 01880 DR DUNCAN B COX JR TITLE: MILITARIZED WATCH (MILWATCH)	ARMY	\$ 49,907
T 88	OFFICE: LABCOM/ETDL	

THE MAIN OBJECTIVE OF THIS PROJECT IS TO DEVELOP A CONCEPTUAL DESIGN

FISCAL YEAR 1986

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OF A HIGHLY PRECISE AND AUTOMATED MILITARY WATCH (MILWATCH) FOR HIGH-ACCURACY TIME TRANSFER, AND TO SHOW THAT THE DESIGN IS FEASIBLE AND PRACTICAL IN IMPLEMENTATION. THE FEATURES OF THE DESIGN ARE TO BE DEMONSTRATED ON THE BASIS OF THEORETICAL ANALYSES OF THE CONSEQUENCES OF THE DESIGN IN CONSIDERATION OF AVAILABLE EXPERIMENTAL AND THEORETICAL DATA ON THE COMPONENTS UTILIZED.

MCCLINTOCK ASSOCS INC  
5102 TIMBER TER  
SAN ANTONIO, TX 78250  
REED MCCLINTOCK

AF

\$ 50,000

## TITLE:

PILOT JUDGMENT SKILLS TEST BATTERY AND AIR COMBAT TRAINING SOFTWARE  
T 285 OFFICE: AMD/RDO

A TRAINING DEVICE IS NEEDED WHICH IS ORIENTED SOLELY TO TEACHING THE COGNITIVE SKILLS REQUIRED BY AIR COMBAT. PROCEDURAL, PERCEPTUAL AND MOTOR SKILLS CAN BE PRACTICED USING SIMULATORS, PART TASK TRAINERS AND TRAINING MISSIONS. THE COGNITIVE SKILLS TRAINER WOULD EMPHASIZE JUDGMENT AND DECISION SKILLS TRAINING. IT WOULD ENABLE A STUDENT TO REHEARSE COGNITIVE PERFORMANCES ASSOCIATED WITH AIR COMBAT MANEUVERS AND COUNTER MANEUVERS IN REALISTIC PROBLEM SETTINGS. THE TRAINER WOULD ALSO HELP STUDENTS FORM APPROPRIATE INTERNAL MODELS OF AIR COMBAT "SCRIPTS" AND WOULD HELP TO REPAIR STUDENT ERRORS IN THE STUDENT'S MODEL OF SPECIFIC SCRIPTS.

MEASUREMENT CONCEPTS INC  
41 HWY 34 SOUTH - COLTS TOWNE PLAZA  
COLTS NECK, NJ 07722  
DR EDWARD COLLET

ARMY

\$ 49,996

## TITLE:

DIGITAL SPECTROSCOPY OF PIEZOELECTRIC CRYSTALLINE MEDIA  
T 84 OFFICE: LABCOM/ETDL

THIS PROPOSAL DESCRIBES THE EXTENSION OF DIGITAL SPECTROMETRY TO THE MEASUREMENT OF THE ANISOTROPIC PERMITTIVITIES OF PIEZOELECTRIC MATERIALS. WE SHOW THAT FRESNEL'S EQUATIONS FOR ANISOTROPIC MEDIA, AS IS THE CASE WITH ISOTROPIC MEDIA, ALSO SIMPLIFY FOR AN INCIDENT ANGLE OF 45 DEG. IN DIGITAL SPECTROMETRY FOR ISOTROPIC MEDIA THE SAMPLE IS FIXED AND THE POLARIZATION STATE OF THE INCIDENT BEAM IS

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AMOUNT

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ROTATED FROM A HORIZONTAL TO A VERTICAL POSITION. THIS ACTION LEADS TO A UNIQUE EQUATION FOR THE REFRACTIVE INDEX. UNFORTUNATELY, WHILE THIS CAN BE DONE FOR ANISOTROPIC MEDIA THE RESULT IS A PAIR OF NON-LINEAR EQUATIONS WHICH ARE NOT READILY SOLVED. HOWEVER, WE HAVE DISCOVERED THAT IF THE OPTICAL BEAM IS FIXED AND THE SAMPLE "FLIPPED" THROUGH 90 DEG, THEN A PAIR OF UNCOUPLED EQUATIONS FOR THE ANISOTROPIC PERMITTIVITIES CAN BE OBTAINED. THE EXPERIMENTAL CONFIGURATION IS THEN DEVELOPED AND DESCRIBED IN THIS PROPOSAL TO MEASURE THESE PERMITTIVITIES.

MEASUREMENT TECHNOLOGY NORTHWEST

AF

\$ 49,993

7703 33RD AVE NE  
SEATTLE, WA 98115  
PETER B ZIEVE

## TITLE:

AN ALUMINUM RIVET FOR USE ABOVE 500 DEG F DEVELOPMENT  
T 145 OFFICE: AFWAL/FI

THE Al-Fe-X FAMILY OF ALUMINUM IS PROPOSED FOR USE ON THE AIRFRAME OF THE ADVANCED TACTICAL FIGHTER (ATF). THE NEW ALLOY MAINTAINS ITS STRUCTURAL PROPERTIES ABOVE 500 DEG F, THE TEMPERATURE REQUIRED OF AN AIRFRAME CAPABLE OF EXTENDED OPERATION AT MACH 3. A NEW HIGH TEMPERATURE FASTENER MUST BE DEVELOPED TO FULLY REALIZE THIS ALLOY'S PROPERTIES. MEASUREMENT TECHNOLOGY NORTHWEST (MTNW) SUGGESTS THAT THE MOST ATTRACTIVE ALTERNATIVE WILL BE A SLUG RIVET OF THE SAME Al-Fe-X MATERIAL. A SLUG RIVET IS LOW IN COST AND PROVIDES BETTER FATIGUE CHARACTERISTICS THAN A PREHEADED RIVET. SEVERAL INSTALLATION TECHNIQUES WILL BE TESTED. MTNW PROPOSES TO MACHINE BOTH SLUG AND COUNTERSUNK RIVETS FROM BILLET MATERIAL OF Al-Fe-Ce AVAILABLE THROUGH AN AGREEMENT WITH ALCOA. UPSET PARAMETERS WILL BE MONITORED. TEST METHODS FOR JOINT YIELD AND ULTIMATE STRENGTH AT ROOM AND ELEVATED TEMPERATURE WILL BE CONDUCTED. MICROSTRUCTURAL ANALYSIS WILL ALSO BE EMPLOYED. THE IMPORTANCE OF THE FASTENER INSTALLATION TECHNIQUE AS WELL AS THE FASTENER INTERFERENCE PATTERN WILL BE INVESTIGATED. FATIGUE TEST COUPONS WILL BE SUPPLIED TO THE AIR FORCE.

MEDIMATRIX INC

ARMY

\$ 48,035

PO BOX 60  
PRINCETON, NJ 08550  
DR JAMES M PACHENCE

## TITLE:

AN ANTIBIOTIC TREATED HEMOSTATIC WOUND DRESSING DEVELOPMENT  
T 214 OFFICE: AMRDC/SGRD

THE TREATMENT OF PARTIAL OR FULL THICKNESS SURFACE WOUNDS IN THE

FISCAL YEAR 1986

SUBMITTED BY

DEPT

AWARDED  
AMOUNT

FIELD AFTER TRAUMATIC INJURY WHEN EVACUATION IS DELAYED IS A SERIOUS PROBLEM DUE TO BLOOD LOSS AND INFECTION. INITIALLY, FLUID LOSS DUE TO BLEEDING CAN LEAD TO SHOCK. INFECTION IS A MAJOR RISK ESPECIALLY WHEN THE INJURY IS TO BE STABILIZED PRIOR TO EVACUATION. THIS FEASIBILITY STUDY IS DESIGNED TO DEVELOP A FIELD DRESSING THAT CONTAINS AN ANTIBIOTIC COUPLED TO A COLLAGEN SPONGE THAT CAN BE STORED WITHOUT REFRIGERATION AND APPLIED UNDER ADVERSE CONDITIONS. A TYPE I COLLAGEN SPONGE WILL BE USED AS THE MATRIX FOR ANTIBIOTIC DELIVERY AS IT IS KNOWN TO BE HEMOSTATIC AS WELL AS BIOCOMPATIBLE AND BIODEGRADABLE. THE RELEASE RATE AND BACTERICIDAL ABILITY OF THE DRESSING WILL BE ASSESSED USING AN ANIMAL MODEL. THE GOAL OF THIS PROJECT IS TO PRODUCE A PROTOTYPE DRESSING WHICH CAN BE APPLIED IN THE FIELD AND WILL HELP STOP BLEEDING AND PREVENT INFECTION WHEN EVACUATION IS DELAYED.

MEGABAR CORP  
2200 W 4100 N  
OGDEN, UT 84404  
JOHN A PETERSON

AF

\$ 48,567

TITLE:

CONTINUOUS PROCESSING OF EMULSION COMPOSITE ROCKET PROPELLANTS  
T 80 OFFICE: AFRPL/TSTR

MEGABAR CORPORATION HAS DEVELOPED AND DEMONSTRATED CONTINUOUS PROCESS TECHNOLOGY FOR THE MANUFACTURE OF ENERGETIC MATERIALS BASED ON OXIDIZING SALTS AND HYDROCARBON FUELS COMBINED IN THE MOLTEN STATE. THE PROCESS APPEARS TO HAVE SIGNIFICANT ADVANTAGES IN THE MANUFACTURE OF SOLID ROCKET PROPELLANTS, SINCE IT IS CAPABLE OF ACHIEVING HIGH SOLIDS LOADINGS WITHOUT RESORT TO MECHANICAL GRINDING, AND SINCE APPROPRIATE BINDERS CAN BE CONTINUOUSLY INCORPORATED IN THE FUEL PHASE WITHOUT BATCH MIXING. THE PROPOSED PROGRAM WILL DEMONSTRATE THE FEASIBILITY OF PRODUCING PROPELLANTS USING EXISTING PROPRIETARY PROCESS EQUIPMENT AND WILL IDENTIFY PROCESS VARIABLES AFFECTING CERTAIN EQUIPMENT AND WILL IDENTIFY PROCESS VARIABLES AFFECTING CERTAIN MECHANICAL AND BALLISTIC PROPERTIES OF SAMPLES SO PRODUCED.

MEGABAR CORP.  
2200 WEST 4100 NORTH  
OGDEN, UT 84404  
M. TAYLOR ABEGG, PHD

SDIO

\$148,351

TITLE:

EMULSION COMPOSITE PROPELLANTS - BASIC PROCESS TECHNOLOGY  
T 6 OFFICE:

MEGABAR CORPORATION HAS DEVELOPED A CONTINUOUS PROCESS FOR THE

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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MANUFACTURE OF ENERGETIC MATERIALS COMPRISING OXIDIZING SALTS AND HYDROCARBON FUELS COMBINED IN THE MOLTEN STATE. THE PROCESS APPEARS TO HAVE SIGNIFICANT ADVANTAGES IN THE MANUFACTURE OF SOLID ROCKET PROPELLANTS, INCE IT IS CAPABLE OF ACHIEVING HIGH SOLIDS LOADINGS WITHOUT RESORT TO MECHANICAL GRINDING, AND SINCE APPROPRIATE BINDERS CAN BE CONTINUOUSLY INCORPORATED IN THE FUEL PHASE WITHOUT BATCH MIXING. WHILE THE PROCESS HAS BEEN EMPLOYED IN THE PRODUCTION OF EXPLOSIVES, NO WORK HAS BEEN DONE TO DETERMINE THE ADAPTABILITY OF THE PROCESS TO THE PRODUCTION OF PROPELLANTS WHICH HAVE TYPICALLY HIGHER VISCOSITIES AND WHICH REQUIRE THE INCORPORATION OF DRY METALLIC POWDERS. THE PROPOSED PROGRAM WILL IDENTIFY PROCESS AND FORMULATION VARIABLES AFFECTING PRODUCTION RATES AND MEASURE THE EFFECTS OF THESE VARIABLES ON PRODUCT STABILITY.

MEMBRANE TECHNOLOGY & RESEARCH INC	ARMY	\$	0
1030 HAMILTON CT			
MENLO PARK, CA 94025			
K V PEINEMANN			
TITLE:			
AIR FILTRATION OF TOXIC GASES USING MEMBRANE TECHNOLOGY			
T 36	OFFICE: CRDC/AMSMC		

TOXIC VAPORS SUCH AS HYDROGEN CYANIDE, CYANOGEN CHLORIDE, PHOSGENE AND NERVE AGENT GB MAY BE ENCOUNTERED BY TROOPS UNDER ATTACK BY CHEMICAL WARFARE AGENTS. BETTER METHODS OF REMOVING THESE VAPORS FROM AIR ARE REQUIRED. THIS PROPOSAL DESCRIBES THE TREATMENT OF THESE VAPORS THROUGH THE USE OF COMPOSITE MEMBRANES EXTREMELY PERMEABLE TO THE VAPOR BUT RELATIVELY IMPERMEABLE TO AIR. SIMILAR MEMBRANES HAVE ALREADY BEEN DEVELOPED AT MEMBRANE TECHNOLOGY AND RESEARCH, INC. (MTR) FOR THE REMOVAL OF ORGANIC EMISSIONS FROM INDUSTRIAL AIR STREAMS. THE MEMBRANE SYSTEMS CAN BE MADE QUITE COMPACT AND LIGHT WEIGHT. EXISTING TECHNOLOGY ALLOWS 100 FT(3)/MIN OF AIR TO BE DEACTIVATED BY A UNIT WITH A VOLUME OF 20 TO 30 FT(3) POWERED BY A 15 TO 20 HP MOTOR. DEVELOPMENT OF MORE EFFICIENT MEMBRANES AND MODULES WOULD ALLOW MORE COMPACT, LIGHT WEIGHT, AND ENERGY EFFICIENT UNITS TO BE BUILT. UNLIKE CARBON ABSORPTION SYSTEMS MEMBRANE UNITS ARE CAPABLE OF CONTINUOUS UNATTENDED OPERATION AND DO NOT REQUIRED PERIODIC REPLACEMENT OR REGENERATION OF THE ABSORPTION BED. IN THIS PHASE I PROGRAM, THE FEASIBILITY OF THE PROCESS WITH MEMBRANES SELECTED FOR THIS SEPARATION WOULD BE TESTED. SMALL SPIRAL WOUND MEMBRANE MODULES WOULD BE USED.

FISCAL YEAR 1986

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MERCURY L.P.E. CO INC 208 FIELD CLUB RIDGE PITTSBURGH, PA 15238 DAVID G RYDING TITLE: LATTICE-MATCHED HgZnTe EPITAXY FOR LONGWAVE INFRARED SENSORS DEVELOPMENT T 151	AF	\$ 74,850
OFFICE: AFWAL/ML		

MERCURY CADMIUM TELLURIDE (HgCdTe) IS A PRIMARY LONGWAVE INFRARED SENSOR MATERIAL. RECENTLY, HgZnTe GIVES INDICATIONS OF BEING SUPERIOR DUE TO A MORE STABLE HgTe BOND. HgZnTe HAS BANDGAP ENERGIES, ELECTRICAL AND OPTICAL PROPERTIES SIMILAR TO HgCdTe. THEREFORE, IT COULD BE CONSIDERED FOR ALL PRESENT HgCdTe TASKS. THE DEVELOPMENT OF SOPHISTICATED HgZnTe INFRARED DEVICE STRUCTURES WILL DEPEND ON AVAILABILITY OF COMPLEMENTARY CdZnTe SUBSTRATES FOR LATTICE MATCHED EPITAXIAL GROWTHS. SIMULTANEOUS DEVELOPMENT OF BOTH A CdZnTe SUBSTRATE AND HgZnTe EPITAXY DATA BASE IS PROPOSED IN THIS WORK.

MERIDIAN CORP 5113 LEESBURG PIKE - STE 700 FALLS CHURCH, VA 22041 MARK D BRYFOGLE TITLE: MUNITIONS LOADING VIA A ROBOTIC STEWART PLATFORM UNDER CLOSED LOOP CONTROL T 29	AF	\$ 49,236
OFFICE: AD/YNS		

THIS STUDY INVESTIGATES THE ENHANCEMENT OF AIRCRAFT MUNITIONS LOADING PROCEDURES. PRESENTLY, MUNITIONS ARE TRANSPORTED FROM THE FLIGHT LINE TO THE AIRCRAFT ON A BOMB LIFT TRUCK EQUIPPED WITH A ONE DEGREE OF FREEDOM (DOF) LIFTING ARM. THE ARM CAN RAISE THE MUNITIONS TO THE CORRECT HEIGHT, BUT THE REMAINING FIVE POSITION DOF ARE ACHIEVED MANUALLY THROUGH THE FLEXURE OF THE ARM OR BY REPOSITIONING THE TRUCK BENEATH THE AIRCRAFT. THIS SLOW MANPOWER INTENSIVE PROCESS WILL BE GREATLY ENHANCED BY RETROFITTING THE TRUCK WITH THE HIGH PAYLOAD SIX DOF STEWART PLATFORM UNDER CLOSED LOOP CONTROL. THIS STUDY WILL INCREASE SUBSTANTIVE KNOWLEDGE OF CLOSED LOOP MANIPULATOR CONTROL AND

FISCAL YEAR 1986

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THE DYNAMIC CAPABILITIES OF THE STEWART PLATFORM. IT IS ANTICIPATED THAT THE STEWART PLATFORM WILL HAVE COMMERCIAL APPLICATION AS A JET ENGINE MOUNTING DEVICE.

MERIX CORP 192 WORCESTER ST WELLESLEY, MA 02181 DR THOMAS W MIX TITLE: EROSION RESISTANT RADOME MATERIALS T 125 OFFICE: NSWC	NAVY	\$ 75,000
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THERE IS A REQUIREMENT FOR AN IMPROVED RADOME MATERIAL, WITH A FINER GRAIN STRUCTURE, GREATER STRENGTH AT ELEVATED TEMPERATURES AND GREATER EROSION RESISTANCE (PARTICULARLY TO RAIN) THAN PRESENT MATERIALS. THIS NEW MATERIAL MUST BE CAPABLE OF BEING FABRICATED INTO INTRICATE SHAPES WITH ACCURATE DIMENSIONS BY COLD FORMING AND ATMOSPHERIC SINTERING; AND ITS CHANGE IN DIELECTRIC CONSTANT MUST BE LESS THAN 5% IN GOING FROM AMBIENT TEMPERATURES (WHERE THE RADOME IS TUNED) TO 2000 DEG F (ITS TEMPERATURE IN USE) TO MINIMIZE BORE-SIGHT ERRORS. ONE TYPE OF CERAMIC COMPOSITE WHICH SEEMS TO HOLD PROMISE IS A COMBINATION OF NbAlO(4) OR HfSiO(4) MIXED WITH SiO(2) AND BN. THE NbAlO(4) AND HfSiO(4) BOTH HAVE HIGHER DIELECTRIC CONSTANTS THAN THE SILICA OR BORON NITRIDE; HOWEVER THEIR HIGH RELATIVE DENSITY WILL PROVIDE PROPORTIONALLY GREATER STRENGTH AND EROSION RESISTANCE. THERE IS A NEED FOR HIGH PURITY POWDERS OF THESE MATERIALS, THAT CAN BE SINTERED TOGETHER INTO DENSE, STRONG, FINE GRAINED RADOME STRUCTURES AT ATMOSPHERIC PRESSURE AND LOW TEMPERATURES.

MERIX CORP 192 WORCESTER ST WELLESLEY, MA 02181 DR THOMAS W MIX TITLE: MEMBRANE DEVELOPMENT FOR AIRCRAFT ON-BOARD INERT GAS GENERATING SYSTEMS T 178 OFFICE: AFWAL/PO	AF	\$ 71,700
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MEMBRANE BASED INERT GAS GENERATING SYSTEMS FOR INERTING OF FUEL TANK ULLAGE SPACE TO CARRY A LOWER AIRCRAFT PENALTY THAN SYSTEMS BASED ON



FISCAL YEAR 1986

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MOLECULAR SIEVES AND SYSTEMS BASED ON STORAGE OF CRYOGENIC NITROGEN. WITH CURRENT TECHNOLOGY, APPROXIMATELY 30 LBS OF MEMBRANE MATERIAL ARE NECESSARY PER LB/MIN OF INERT GAS REQUIRED. MERIX PROPOSES A NEW APPROACH FOR PRODUCING A COMPOSITE AIR SEPARATION MEMBRANE WITH IMPROVED FLUX AND SELECTIVITY, WHICH SHOULD REDUCE REQUIRED MATERIAL WEIGHT BY AN ORDER OF MAGNITUDE. IN THIS APPROACH, AN ULTRA-THIN SELECTIVE BARRIER IS DEPOSITED VIA GLOW-DISCHARGE ONTO A HIGH-FLUX MATERIAL UNDERCOAT SUPPORTED BY A PROOUS SUBSTRATE. EXTENSIVE WORK PERFORMED BY MERIX HAS DEMONSTRATED THE FEASIBILITY OF THIS APPROACH, AND HAS LED TO THE CONCEPTION OF A NOVEL GLOW DISCHARGE PROCESS WHICH SHOULD ENABLE SUBSTANTIAL IMPROVEMENTS IN BOTH SELECTIVITY AND PERMEABILITY OF MEMBRANE MODULES FOR O(2)/N(2) SEPARATION. THIS PHASE I PROPOSAL OUTLINES A PROGRAM FOR THE INVESTIGATION OF THIS NOVEL PROCESS, THE OPTIMIZATION OF THE MERIX COMPOSITE MEMBRANE, AND THE FABRICATION OF A LABORATORY SCALE TEST UNIT.

MERRITT CASES INC  
PO BOX 1206  
REDLANDS, CA 92373  
K B MORRILL

DNA

\$ 49,892

TITLE:

DYNAMIC SURFACE STRAIN GAGE

T 3 OFFICE: AM/SBIR

MOST ANALYTICAL METHODS USED TO PREDICT THE BEHAVIOR OF TUNNELS SUBJECTED TO GROUND SHOCK REQUIRE MAKING JUDGMENTS REGARDING ACCEPTABLE LEVELS OF TANGENTIAL STRAIN AROUND THE TUNNEL SURFACE. THE CAPABILITY TO MEASURE DYNAMIC TANGENTIAL STRAINS ON THE SURFACES OF TUNNELS WOULD PROVIDE AN EXCELLENT MEANS OF DIRECTLY ASSESSING THE VALIDITY OF ANALYTICAL METHODS. THE OVERALL STUDY OBJECTIVE IS TO DEVELOP A ROCK STRAIN GAGE CAPABLE OF RELIABLY MEASURING STATIC AND DYNAMIC STRAIN ON THE SURFACE OF A TUNNEL OR OTHER CAVITY IN ROCK. THE PHASE I OBJECTIVE IS TO DEVELOP A PROTOTYPE ACTIVE GAGE AND ASSESS ITS CAPABILITY UNDER LABORATORY CONDITIONS. THE CONCEPT TO BE INVESTIGATED USES A LINEAR VARIABLE DIFFERENTIAL TRANSFORMER (LVDT) AS THE STRAIN SENSOR. EMPHASIS WILL BE PLACED ON ACHIEVING ACCURATE MEASUREMENTS AT ONE-HALF TO TWO PERCENT STRAIN. GAGES WILL BE DESIGNED TO MINIMIZE OFF-AXIS SENSITIVITY TO DYNAMIC LOADS. ANCHORAGE DESIGNS WILL ENSURE THAT THE GAGE DEFORMS WITH THE ROCK SURFACE, EVEN IN THE PRESENCE OF A STRAIN GRADIENT WITH DEPTH. LABORATORY TESTING WILL CONSIST OF UNCONFINED COMPRESSION, BEAM

FISCAL YEAR 1986

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FLEXURE, AND VIBRATION TESTS. IF SUPPORTED BY THE RESULTS, A PREFERRED GAGE DESIGN WILL BE SELECTED FOR FOLLOW-ON LABORATORY AND FIELD TESTING IN PHASE II.

MICREL, INC. 639 NORTH PASTORIA AVE. SUNNYVALE, CA 94086 MARTIN ALTER TITLE: DRAMATICALLY IMPROVED RADIATION HARDNESS FOR CMOS SILICON GATE INTEGRATED CIRCUITS EVEN DOWN TO CRYOGENIC TEMPERATURES T 7 OFFICE:	SDIO	\$ 50,000
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THERE HAS BEEN MUCH EXPERIMENTAL WORK DONE AND MUCH SUCCESS IN PRODUCING GATE OXIDES FOR MOS DEVICES WHICH ARE "RAD-HARD" (WHICH TYPICALLY RELATES TO TOTAL GAMMA-DOSE HARDNESS); THIS WORK TYPICALLY INVOLVES AN ULTRA-THIN OXIDE (OXIDE-NITRIDE SANDWICH), SKEWED THRESHOLD (TO ALLOW FOR SHIFT), SPECIAL CIRCUIT-DESIGN, AND MODIFIED OXIDE AND INTERFACE CHARACTERISTICS. VERY LITTLE WORK HAS BEEN DONE TO IMPROVE THE "HARDNESS" OF THE PARASITIC N-CHANNEL AND P-CHANNEL FIELD DEVICES, AND THIS IS UNFORTUNATE SINCE THIS CAN TYPICALLY INVERT (AND THUS FAIL) BEFORE THE NORMAL ENHANCEMENT DEVICES. ONE REASON THERE HAS BEEN LITTLE SUCCESS WITH IMPROVING FIELD DEVICE HARDNESS IS THAT THE TWO TRADITIONAL APPROACHES OF THIN-OXIDE AND INCREASED DOPING ARE IMPRACTICAL USING TRADITIONAL "ISOPLANAR-TYPE" CMOS DUE TO SUB-THRESHOLD LEAKAGE AND LOW-AVALANCHE VOLTAGE RESPECTIVELY WHICH WOULD RESULT. THIS PROPOSAL USES A DRAMATICALLY DIFFERENT ALTHOUGH VERY STRAIGHTFORWARD FABRICATION APPROACH WHICH USES A SPECIAL POLYSILICON FIELD-PLATE. THE HIGHLIGHTS ARE AS FOLLOWS: 1) PARASITIC FIELD DEVICE CAN USE OXIDES AS THIN AS 80-100A AND NO CHANNEL STOP DOPING. 2) ZERO-CROSS TALK. 3) SIMPLE PROCESS CONCEPTS. 4) PROCESS IS DENSE. 5) PROCESS IS PRECISE (NO "BIRD'S-BEAK"). 6) LOW-STRESS, LOW-NOISE PROCESS. 7) LAYOUT IS STRAIGHTFORWARD. 8) HIGH YIELD PROCESS. 9) HIGH-SPEED TRANSISTORS. 10) REDUCED LATCH-UP. 11) HIGH RELIABILITY GATE-OX.

MICRILOR INC 9 LAKESIDE OFFICE PARK WAKEFIELD, MA 01880 DR JOHN H CAFARELLA TITLE: COMMUNICATIONS FOR BIOSTATIC RADARS T 42 OFFICE: ESD/XRCT	AF	\$ 72,846
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ADVANCED ESM AND ANTIRADIATION MISSILES HAVE MADE OPERATION OF A

FISCAL YEAR 1986

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RADAR ON THE MODERN BATTLEFIELD VERY RISKY. A POPULAR APPROACH TO MAKING RADARS SURVIVABLE IS TO USE PASSIVE RECEIVERS FOR PROCESSING TARGET RETURNS USING NON-COLOCATED TRANSMITTERS; THE PASSIVE RECEIVERS ARE INVULNERABLE TO INTERCEPT WHILE PERFORMING THEIR RADAR PROCESSING. UNFORTUNATELY THIS PASSIVE CONVERTNESS OF SUCH BISTATIC RECEIVERS CAN BE LOST WHEN TARGET INFORMATION IS TRANSMITTED BACK. THE USE OF ADVANCED SPREAD-SPECTRUM TECHNIQUES, COMBINED WITH NETWORKING FOR MINIMUM LINK RANGES, COULD PROVIDE LOW-PROBABILITY-OF-INTERCEPT (LPI) AGAINST SOPHISTICATED THREATS. THE TECHNOLOGIES FOR COMMUNICATIONS AND RADAR ARE SIMILAR ENOUGH THAT SHARED HARDWARE IS POSSIBLE.

MICRO-MODE PRODUCTS INC  
1870 JOHN TOWERS AVE  
EL CAJON, CA 92020  
RAY JUSTICE

NAVY

\$ 50,000

TITLE:

TEM-TE QUDAXIAL LINE

T 157

OFFICE: NAVSEA/NOSC

TO BRING OUT AN INNER COAX THAT ALSO SERVES AS THE INNER CONDUCTOR TO AN OUTER COAX, IT IS PROPOSED TO TRANSITION THE INNER COAX FROM TEM TO Te. THIS ALLOWS THE INNER COAX THEN TO BE BROUGHT OUT OF THE OUTER WITH CONDUCTING RINGS PERPENDICULAR TO THE TEM FIELD LINES IN THE OUTER COAX THEREBY MINIMIZING INTERFERENCE.

MICROCOATINGS INC  
ONE LYBERTY WY  
WESTFORD, MA 01886  
JOHN C SIMONS

AF

\$ 47,300

TITLE:

HIGH RESOLUTION UV FILTER DEVELOPMENT

T 72

OFFICE: AFGL/XOP

A PROGRAM IS PROPOSED TO DEVELOP AND DEMONSTRATE FEASIBILITY OF A DESIGN AND MANUFACTURING TECHNOLOGY FOR PRODUCING OPTICAL INTERFERENCE FILTERS THAT CAN TRANSMIT ULTRAVIOLET IMAGES (SUCH AS MISSILE PLUMES) WHILE MAINTAINING HIGH IMAGE RESOLUTION AND REJECTING VISIBLE AND LONGER WAVELENGTH RADIATIONS. COMPARED TO FILTERS PRESENTLY USED, ULTRAVIOLET IMAGE QUALITY IS EXPECTED TO BE SUBSTANTIALLY IM-

FISCAL YEAR 1986

SUBMITTED BY

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PROVED. COMPUTER-ASSISTED DESIGNS OF FILTER COATINGS WILL BE DEVELOPED TO SATISFY DESIRED SPECTRAL PERFORMANCE AND REJECTION. EXPERIMENTAL FILTERS WILL BE FABRICATED TO THESE DESIGNS, EVALUATED FOR SPECTRAL PERFORMANCE, AND TESTED FOR ENVIRONMENTAL STABILITY AND DURABILITY. SELECTED FILTERS WILL BE EVALUATED FOR UV IMAGE TRANSMISSION QUALITY. SPECIFICATION OBJECTIVES FOR RESOLUTION, SPECTRAL PERFORMANCE, AND OUT-OF-BAND REJECTION ARE EXPECTED TO BE ACHIEVED. TO CONFIRM FEASIBILITY, PROTOTYPE FILTERS REPRESENTATIVE OF THE DESIRED FINAL CHARACTERISTICS WILL BE FABRICATED, TESTED, AND DELIVERED WITH ACCOMPANYING DATA.

MICROEXPERT SYSTEMS INC  
21405 DEVONSHIRE BLVD - #219-220  
CHATSWORTH, CA 91313  
PAUL GRIFFITH

ARMY

\$ 49,940

## TITLE:

MAINTENANCE TRAINER: AN EMBEDDED KNOWLEDGE BASED SYSTEM FOR  
EQUIPMENT REPAIR

T 112

OFFICE: MICOM

MAINTENANCE TRAINER IS AN EMBEDDED SYSTEM FOR TEACHING TECHNICIANS HOW TO MAINTAIN EQUIPMENT. IT RESPONDS TO THE GROWING NEED TO TRAIN MAINTENANCE EXPERTS IN A TIME OF EVER MORE INTRICATE WEAPONRY. MAINTENANCE TRAINER COMBINES AN EXPERT SYSTEM FOR TROUBLESHOOTING WITH INTELLIGENT TUTORING SYSTEM TECHNOLOGY. IT SHOULD NOT ONLY IMPROVE THE PERFORMANCE OF TECHNICIANS IN THE SPECIFICS OF MAINTAINING A GIVEN PIECE OF EQUIPMENT, BUT SHOULD TEACH GENERAL PRINCIPLES TO IMPROVE HIS OVERALL PERFORMANCE. THE INTELLIGENT TUTOR WILL MODEL AN IDEAL SOLUTION TO THE TROUBLESHOOTING PROBLEM TO USE AS A TEMPLATE FOR EVALUATING STUDENT PERFORMANCE. IT WILL MODEL THE PROCESS OF STUDENT LEARNING. IT WILL INTERACT WITH THE STUDENT IN A FLEXIBLE AND FRIENDLY WAY, INTERFERING WHEN NECESSARY TO CORRECT ERRORS AND THE REASONING THAT CREATED THEM. THE EXPERT SYSTEM WILL UTILIZE RULE BASED KNOWLEDGE SYSTEM AND INFERENCE TECHNIQUES. MAINTENANCE TRAINER SHOULD REDUCE THE COST AND DECREASE THE TIME FOR TRAINING MAINTENANCE TECHNICIANS, AS IT STRENGTHENS THEIR SKILLS. PHASE I OF THE PROJECT WILL COMPLETE THE SYSTEM DESIGN AND DEMONSTRATE THE CONCEPT.

MICROEXPERT SYSTEMS INC  
21405 DEVONSHIRE BLVD - #219-220  
CHATSWORTH, CA 91313  
STEVEN WRIGHT

ARMY

\$ 0

## TITLE:

IKIS: AN INTELLIGENT KNOWLEDGE BASED TUTORING SYSTEM

T 221

OFFICE: ARI/PERI

IKIS, THE INTELLIGENT KNOWLEDGE BASED TUTORING SYSTEM, WILL BE AN

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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INTELLIGENT TUTORING SYSTEM FOR MAINTENANCE TRAINING. IT WILL MODEL AN IDEAL SOLUTION TO THE PROBLEM UNDER STUDY. USING THAT MODEL AS A TEMPLATE FOR EVALUATING STUDENT PERFORMANCE, IKIS WILL INTERACT WITH THE STUDENT TO REINFORCE RIGHT ANSWERS AND INTERFERE IN A TIMELY FASHION TO CORRECT FACTUAL AND PROCEDURAL ERROR, IN ORDER TO TEACH USERS TO GENERATE THEIR OWN MORE ACCURATE MODELS OF PROBLEM SOLVING, IKIS WILL BE FLEXIBLE, RESPONSIVE, AND STUDENT ORIENTED. IKIS WILL INTEGRATE DISTINCT EXPERT SYSTEMS TO MODEL THE SYSTEM UNDER STUDY, IDEAL AND OTHER PROBLEM SOLUTIONS, AND STUDENT RESPONSES. IKIS WILL RUN ON A MICROCOMPUTER, WILL UTILIZE TYPICAL RULE-BASED KNOWLEDGE SYSTEM TECHNOLOGIES, HAVE INFERENTIAL CAPABILITIES, AND INTERACT THROUGH A NATURAL LANGUAGE-LIKE INTERFACE. IN MODELLING STUDENT BEHAVIOR, IT WILL DRAW UPON PUBLISHED RESEARCH AND INTERVIEWS. IKIS SHOULD ULTIMATELY REDUCE THE COST, STRENGTHEN THE IMPRINT, AND INCREASE THE SPEED OF MAINTENANCE TRAINING. DURING PHASE I, THE SYSTEM WILL BE DESIGNED AND SPECIFIED AT THE SYSTEM LEVEL, AND THE CONCEPT FEASIBILITY DEMONSTRATED.

MICROSCIENCES RT 4 - BOX 286 LEESBURG, VA 22075 JAMES K ROCKS TITLE: WHOLE SKY SENSOR: AN INSTRUMENT FOR THE MEASUREMENT OF CLOUD HEIGHT VELOCITY AND CHARACTERISTICS T 5 OFFICE: AFOSR/XOT	AF	\$ 50,000
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THE HEIGHT AND VELOCITY OF CLOUDS OVER A SIGNIFICANT PORTION OF THE VISIBLE SKY CAN BE DETERMINED FROM THE GROUND BY MEANS OF TRIANGULATION WITH A PAIR OF CCD SENSORS. PATTERN RECOGNITION ON SHAPES CAN IDENTIFY THE TYPES OF CLOUDS. MOTION OF FEATURES OF THE SURFACES OF CLOUDS CAN IDENTIFY CLOUD DYNAMICS. WE PROPOSED TO CONSTRUCT AN INSTRUMENT USING OFF-THE-SHELF HARDWARE, AND APPLY COMPUTER ALGORITHMS THAT HAVE BEEN DEVELOPED AND TESTED IN SIMULATIONS BY THE PRINCIPAL INVESTIGATOR IN ORDER TO PROVE THE CONCEPT.

MICROSCOPY RESEARCH LABS INC PO BOX 5115 NORTH BRANCH, NJ 08876 JACK R ALONZO TITLE: HIGH TEMPERATURE COMPOSITE (HTC) PHYSICOCHEMICAL INTERACTIONS TO 4000 DEG F T 165 OFFICE: AFWAL/ML	AF	\$ 50,000
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THIS IS A TWO-OBJECTIVE PROPOSAL TO STUDY THE OXIDATION OF HIGH

FISCAL YEAR 1986

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<p>TEMPERATURE COMPOSITE MATERIALS (HTC'S) IN A GAS/SOLID REACTION STAGE OF A SCANNING ELECTRON MICROSCOPE (SEM) AT TEMPERATURES UP TO 1600 DEG C (2912 DEG F), AND TO DESIGN A LASER HEATING SYSTEM FOR THE SEM TO EXTEND ITS RANGE TO 3000 DEG C (5432 DEG F). THE OXIDATION STUDIES WILL PRODUCE REAL-TIME VIDEOTAPES OF HTC'S UNDERGOING OXIDATION WITH RESOLUTION OF APPROXIMATELY 300 ANGSTROMS. THESE MICROSCOPIC OBSERVATIONS TOGETHER WITH THEIR INTERPRETATIONS WILL PROVIDE HITHERTO UNAVAILABLE INSIGHTS INTO THE BEHAVIOR OF THESE MATERIALS. THE SECOND, AND PRIMARY OBJECT IS TO DESIGN A LASER HEATED REACTIVE GAS STAGE THAT WILL PERMIT SIMILAR OBSERVATIONS OF HTC'S AT EXTREME TEMPERATURE. THIS DESIGN WILL FORM THE BASIS OF A PHASE II EFFORT TO BUILD THE STAGE AND EXTEND THE RANGE OF THE STUDIES.</p>		

MICROTRONICS ASSOC. 6354 MORROWFIELD AVENUE PITTSBURGH, PA 15217 DARRYL D. COON, PHD TITLE: SENSORS FOR NEW TYPES OF INFRARED IMAGING SYSTEMS	SDIO	\$ 96,782
T 3 OFFICE:		

THIS PROPOSAL IS TO DEVELOP INJECTION MODE INFRARED DETECTORS, WHICH COULD LEAD TO THE DEVELOPMENT OF NEW TYPES OF INFRARED IMAGING SYSTEMS. THE DETECTION MODE FEATURES LARGE DETECTOR OUTPUT SIGNALS WITHOUT THE USE OF PREAMPLIFIERS. THUS, THE DIFFICULTY OF MANAGING LOW LEVEL ELECTRICAL SIGNALS ASSOCIATED WITH ARRAYS OF DETECTORS AND IMAGING SYSTEMS COULD BE ELIMINATED. THE DETECTION MODE EMPLOYS EXTRINSIC SILICON DETECTORS. RECENT SPECTRAL MEASUREMENTS INDICATE THAT THE USEFUL WAVELENGTH RANGE OF THIS MODE OVERLAPS WAVELENGTH RANGES OF EXTRINSIC DETECTORS OPERATING IN CONVENTIONAL MODES. THIS MEANS THAT INJECTION MODE DEVICES COULD PROVIDE ADVANTAGEOUS ALTERNATIVES TO CONVENTIONAL EXTRINSIC DEVICES IN SIMILAR APPLICATIONS. THE PROJECT WOULD FOCUS ON IMPROVED UNDERSTANDING OF INJECTION MODE DEVICE PHYSICS IN ORDER TO PAVE THE WAY FOR IMPROVEMENTS IN PERFORMANCE AND FABRICATION OF DEVICES UNDER PHASE II. THE PROJECT WOULD PROVIDE A PRELIMINARY STUDY OF ISSUES RELATED TO ARRAYS AND IMAGING SYSTEMS AS THIS WOULD BECOME THE MAIN THRUST OF PHASE II. INJECTION MODE PULSE OUTPUT SUGGESTS AN ANALOGY WITH INTENSITY CODING BY FREQUENCY OF NERVE FIRING IN ANIMAL AND HUMAN VISION. THIS ANALOGY WOULD BE EXAMINED AS A POSSIBLE BASIS FOR NOVEL APPROACHES TO HIGH RESOLUTION INFRARED IMAGING, TARGET MOTION PERCEPTION AND PATTERN RECOGNITION.

FISCAL YEAR 1986

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TION.

MICROWAVE MEDICAL SYSTEMS INC WEST BARE HILL RD HARVARD, MA 01451 KENNETH L CARR TITLE: HUMAN CORE TEMPERATURE MEASUREMENT DEVICE T 219 OFFICE: AMRDC/SGRD	ARMY	\$ 50,000
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THE PROPOSED PROGRAM FOR MONITORING BODY TEMPERATURE UTILIZES PASSIVE, NONINVASIVE MICROWAVE RADIOMETRY TO MEASURE AND MONITOR CORE TEMPERATURE. A MICROWAVE RADIOMETER - A SENSITIVE MICROWAVE RECEIVER - ALLOWS THE MEASUREMENT OF NATURAL ELECTROMAGNETIC EMISSION FROM THE BODY AT MICROWAVE FREQUENCIES. DICKE RADIOMETERS DEVELOPED TO DATE [1,2] FOR DETECTION OF PATHOLOGIC CONDITIONS IN WHICH THERE ARE DISEASE-RELATED TEMPERATURE DIFFERENTIALS, IN PARTICULAR CANCEROUS TISSUE, HAVE DEMONSTRATED A MINIMAL DETECTABLE TEMPERATURE SENSITIVITY OF LESS THAN 0.1 DEG C. THE EXISTING RADIOMETER WILL BE MODIFIED TO ALLOW REMOTE WIRELESS SENSING UTILIZING A SMALL PRINTED CONTACT ANTENNA PREVIOUSLY DESIGNED [3] FOR THE EARLY DETECTION OF EXTRAVASATION OF INTRAVENOUS CYTOTOXIC DRUGS. THE MATERIAL USED FOR THE PRINTED ANTENNA IS FLEXIBLE, PROVIDING THE ABILITY TO CONFORM TO THE BODY SURFACE. THIS ANTENNA, COUPLED WITH A SINGLE POLE DOUBLE THROW DIODE SWITCH AND LOW NOISE AMPLIFIER FOLLOWED BY AN OUTPUT OR COUPLING ANTENNA, WILL FORM A MINIATURE MONOLITHIC MICROWAVE INTEGRATED SUBSYSTEM ALLOWING THE TRANSMITTAL OF TEMPERATURE DATA TO THE REMOTE MONITORING SYSTEM.

MILLIMETER WAVE TECHNOLOGY INC 1395 MARIETTA PKWY - BLDG 700 MARIETTA, GA 30067 DENNIS J KOZAKOFF TITLE: DEPOLARIZATION EFFECTS OF RADOMES T 105 OFFICE: MICOM	ARMY	\$ 50,000
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THE DELETERIOUS EFFECTS OF RANDOM DEPOLARIZATION ON POLARIMETRIC PROCESSED SEEKER PERFORMANCE INCLUDING CORRUPTION OF THE PROCESSED DATA WHEREIN THE ABILITY TO ACHIEVE TARGET DISCRIMINATION AND/OR

FISCAL YEAR 1986

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CLASSIFICATION IS REDUCED. IF THE SYSTEM USES MONOPULSE TRACKING, A SECONDARY IMPLICATION OF RADOME POLARIZATION IS AN INCREASED SYSTEM VULNERABILITY TO NULL JAMMER-TYPE COUNTERMEASURES. THIS RESEARCH WILL CONSOLIDATE THREE EXISTING MWT RADOME CODES: 1) RADOME TRANSMISSION CODE (RACEP), 2) POLARIMETRIC SEEKER MODEL (RADSYM), AND 3) FFT PROCESSOR CODE (FFT). MWT PROPOSES TO EXERCISE THESE CODES TO INVESTIGATE FFTPROCESSED POLARIMETRIC THEORETICAL TARGET RETURNS (SPECTRA) UNDER VARIOUS RADOME CONDITIONS (WALL CONSTRUCTION, WALL ORDER AND SHAPE). THEN, USING FREQUENCY AGILE DATA AVAILABLE FROM THE EGLIN AFB TABILS DATA BANK, MWT WILL INVESTIGATE THE ACTURAL IMPACT OF RADOME DEPOLARIZATION ON RADAR PROCESSED DATA OF TARGETS INCLUDING CLUTTER CONDITIONS.

MILLIMETER WAVE TECHNOLOGY INC 1395 MARIETTA PKWY - BLDG 700 MARIETTA, GA 30067 RONALD E FORSYTHE TITLE: PAVEMENT ICE DETECTOR SYSTEM T 201 OFFICE: CRREL/COE	ARMY	\$ 50,000
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THE DEVELOPMENT OF A REMOTE MEANS FOR DETECTING ICE FORMATION ON PAVEMENT USING A MILLIMETER-WAVE RADIOMETRIC SENSOR IS PROPOSED. A RADIOMETRIC SENSOR HAS UNIQUE ADVANTAGES OVER OTHER REMOTE-SENSING SCHEMES AND HAS DEMONSTRATED ICE DETECTION CAPABILITIES IN OTHER, SIMILAR APPLICATIONS. THE SENSOR MAY BE DEVELOPED IN A TOTALLY PASSIVE MODE, OR ALTERNATIVELY, UTILIZED A WEAK TRANSMITTING SOURCE IN A SEMI-ACTIVE MODE.

MILLITECH CORP PO BOX 109 - S DEERFIELD RESEARCH PK SOUTH DEERFIELD, MA 01373 DAVID K WALKER TITLE: ADVANCED 94 GHz GaAs GUNN SOURCES T 79 OFFICE: LABCOM/ETDL	ARMY	\$ 49,980
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THE REQUIREMENT FOR HIGHER POWER AND MORE EFFICIENT MILLIMETER WAVE SOURCES FOR SMART MUNITIONS LEADS US TO SUGGEST GUNN DIODES AS AN AREA OF POSSIBLE IMPROVEMENT. WE PROPOSE TO INITIATE A RESEARCH PRO-



FISCAL YEAR 1986

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GRAM WHICH WILL IDENTIFY AND CHARACTERIZE GaAs GUNN DIODE DESIGN AND FABRICATION IMPROVEMENTS FOR BOTH DISCRETE AND MONOLITHIC CONFIGURATIONS, LEADING TO THE FABRICATION AND EVALUATION OF DEVICES AND CIRCUITS BASED ON THESE STUDIES. PROPOSED AREAS OF RESEARCH INCLUDE: CONTACT METALIZATION, "NOTCHED" CATHODES, HETEROJUNCTION CONTACTS AND OTHER STRUCTURES RELATED TO HOT ELECTRON INJECTION AND/OR CURRENT LIMITING; GRADED DRIFT REGIONS, SUBSTRATE AND CONTACT GEOMETRIES, AND OTHER CONSIDERATIONS OF EFFICIENT THERMAL DISSIPATION; AND CIRCUIT DESIGNS RELEVANT TO MONOLITHIC IMPLEMENTATIONS, INCLUDING RESONANT STRUCTURES, POWER COMBINING, AND THERMAL EFFICIENCY. EMPHASIS WILL BE GIVEN TO DEVELOPING 94 GHz HIGH-POWER GUNN SOURCES APPROPRIATE TO THE MLRS-TGW OR SIMILAR SYSTEMS, TAKING INTO ACCOUNT PERFORMANCE, RELIABILITY, PRODUCIBILITY, AND COST.

MISSION RESEARCH CORP  
PO DRAWER 719  
SANTA BARBARA, CA 93102  
DR STEVEN F STONE

AF

\$ 49,730

## TITLE:

MODELING TECHNIQUES FOR COMPOSITES SUBJECTED TO RAPID THERMAL LOADING

T 132

OFFICE: AFWAL/FI

MISSION RESEARCH CORPORATION PROPOSES A SBIR PHASE I PROGRAM THAT WILL DETERMINE THE EFFECT OF RAPID THERMAL LOADING ON LAMINATED COMPOSITES IN THE PRESENCE OF DEBONDING OR DELAMINATIONS. EMPHASIS WILL BE GIVEN ON COUPLED THERMOELASTIC PROBLEMS SINCE RAPID THERMAL LOADING PRODUCES HIGH FREQUENCY THERMAL SHOCKS SO THAT THE TIME RATE OF VOLUMETRIC STRAIN IS, IN GENERAL, NOT SMALL COMPARED TO THE TIME RATE OF THE TEMPERATURE FIELD PRODUCED BY SUCH LOADING. EXTENSION OF THE ZONE OF DELAMINATION WILL BE ANALYZED USING THERMALLY DEPENDENT CRITICAL BOND TOUGHNESS CRITERION SO AS TO DETERMINE THE SURVIVABILITY OF THE COMPOSITE DURING THE APPLICATION OF THERMAL LOAD. EFFECTS OF MULTIPLE ZONES OF DEBONDING WILL BE INVESTIGATED IN THE LATER PHASE OF THE PROGRAM BY PAIRWISE INTERACTION TECHNIQUES TO STUDY THE FEASIBILITY OF LINKAGE OF TWO ZONES OF DELAMINATIONS. EXPERIMENTS WILL BE CONDUCTED DURING THE FOLLOW-ON PHASE II EFFORT TO DEMONSTRATE THE VALIDITY OF THE MODELS.

MISSION RESEARCH CORP  
PO DRAWER 719  
SANTA BARBARA, CA 93102  
DR STEVEN F STONE

ARMY

\$ 49,566

## TITLE:

VOID FORMATION STUDY IN FILAMENT WOUND STRUCTURES

T 131

OFFICE: LABCOM/MTL

MISSION RESEARCH CORPORATION (MRC) PROPOSES AN SBIR PHASE I EFFORT

FISCAL YEAR 1986

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AMOUNT

WHICH WILL INITIATE THE STUDY OFF FILAMENT WINDING TECHNIQUES TO DECREASE VOID FORMATION DURING FABRICATION OF STRUCTURAL COMPOSITES. THIS STUDY WILL ENCOMPASS A REVIEW OF MANUFACTURING PROBLEMS OF AND SOLUTIONS TO AIR ENTRAPMENT, AND VOLATILE AND MOISTURE FORMATION THAT CAUSES VOIDS IN FILAMENT WOUND OR PULTRUDED PARTS. MRC WILL USE THIS INFORMATION TO DESIGN A RESIN BATH SUITABLE FOR FIBER/RESIN MATRICES AND ADDRESS THE MAJOR SOURCES OF AIR ENTRAPMENT. THE PHASE I EFFORT WILL INCLUDE CONSULTING FILAMENT WINDING EXPERTS TO HELP DEFINE THE CRITICAL BATH PARAMETERS. LABORATORY WOUND RINGS OF WET FIBERS WILL BE MADE AND TESTED FOR IMPROVED PROPERTIES. MATERIALS WILL BE SELECTED FOR EASE OF HANDLING AND END PRODUCT USE IN THE PHASE I EFFORT. A PORTABLE FIBER AND RESIN FEEDING SYSTEM FOR FILAMENT WINDING IN THE FIELD WILL BE PROPOSED WITH DEVELOPMENT OCCURRING DURING THE FOLLOW ON PHASE II PROGRAM.

MISSION RESEARCH CORP.  
P.O. DRAWER 719  
SANTA BARBARA, CA 93102  
STEVEN F. STONE, PHD

SDIO

\$ 49,970

## TITLE:

MULTI ENVIRONMENT PROTECTION CONCEPTS FOR STRATEGIC ASSET  
SURVIVABILITY AND ANTI DISCRIMINATION

T 7 OFFICE:

MISSION RESEARCH CORPORATION PROPOSES AN SBIR PHASE I PROGRAM THAT WILL INITIATE AN EFFORT TO DESIGN AND ANALYZE MULTI-ENVIRONMENT COMPATIBLE HARDENING AND ANTI-DISCRIMINATION CONCEPTS WHICH CAN BE USED TO PROTECT STRATEGIC ASSETS FROM THE EFFECTS OF BENIGN, NUCLEAR INDUCED AND DIRECTED ENERGY WEAPON EFFECTS. CURRENT AND PROJECTED BOOSTERS, RV'S, AND DECOYS AS WELL AS SATELLITES AND SPACE BASED SENSORS WILL BE SUBJECTED TO AN ARRAY OF THREAT ENVIRONMENTS. HARDENING TECHNIQUES MUST BE DEVELOPED WHICH NOT ONLY PROVIDE BALANCED HARDENING LEVELS ACROSS THE THREAT SPACE BUT CAN BE INTEGRATED INTO THE STRUCTURAL DESIGNS OR DESIGNED INTO A PROTECTIVE CANNISTER CONTAINING THE ASSET. CURRENT HARDENING TECHNIQUES ARE OPTIMIZED FOR THREAT SPECIFIC PERFORMANCE AND IN MOST CASES ARE INCOMPATIBLE WITH REQUIREMENTS OFTEN IMPOSED BY DESIGN AND THREAT CONDITIONS. HARDENING PENALTY ESTIMATES FOR VULNERABILITY ASSESSMENTS ARE THUS HIGHLY QUESTIONABLE. WEIGHT PENALTIES ASSOCIATED WITH COUPLING OPTIMIZED THREAT SPECIFIC CONCEPTS TO THE STRUCTURES THROUGH THE USE OF NOVEL INTERFACE HSIELDS WILL BE ANALYTICALLY COMPARED WITH

FISCAL YEAR 1986

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PENALTIES ASSOCIATED WITH PROPOSED THREAT COMPATIBLE CONCEPTS. TEST PLANS AND EXPERIMENTAL DESIGNS WILL BE GENERATED TO SUPPORT THE ACTUAL TESTING WHICH WOULD BE CONDUCTED DURING THE FOLLOW-ON PHASE II EFFORT.		

MISSION RESEARCH CORP. P.O. DRAWER 719 SANTA BARBARA, CA 93102 STEVEN F. STONE, PHD TITLE: NOVEL IMPULSE MANAGEMENT SHIELD FOR MULTI ENVIRONMENT PROTECTION AND ANTI DISCRIMINATION T 7 OFFICE:	SDIO	\$ 50,039
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MISSION RESEARCH CORPORATION PROPOSES AN SBIR PHASE I PROGRAM THAT WILL INITIATE AN EFFORT TO DESIGN AND ANALYZE AN INNOVATIVE STRUCTURAL RESPONSE ISOLATION/MANAGEMENT CONCEPT WHICH CAN BE USED IN BOTH AN IMPULSE SHIELD AND AN ANTI-DISCRIMINATION MODE TO COUNTER THE EFFECTS OF MATERIAL VAPORIZATION-INDUCED IMPULSE CAUSED BY NUCLEAR AND DIRECT ENERGY WEAPONS. THE CONCEPT WHEN USED IN AN ATTACHED-RETROFIT ORIGINAL DESIGN MODE CAN PROTECT BOOSTERS AND REENTRY VEHICLES AND PREVENT DISCRIMINATION OF DECOYS. SIMILARLY, IT CAN BE INCORPORATED INTO A PROTECTIVE CANNISTER DESIGNED TO PROTECT SPACE-BASED SENSORS AND SATELLITES. EXISTING SINGLE LAYER/SINGLE EXPOSURE FLOOD-LOADED IMPULSE CONCEPTS WILL BE REJECTED IN FAVOR OF NOVEL MULTIPLE LAYER/MULTIPLE EXPOSURE CONCEPTS CAPABLE OF SUSTAINING MULTIPLE SMALL SPOT IMPULSES BY TRAPPING, REDISTRIBUTING, AND REJECTING IMPULSE-GENERATED MOMENTUM. MODIFICATIONS TO EXISTING MRC CODES WILL BE MADE TO ASSESS THE EFFECTS OF NON-SYMMETRIC/OFF-AXIS LOADS. HARDENING LEVELS AND WEIGHT PENALTIES WILL BE CALCULATED. TEST PLANS/EXPERIMENTAL CONCEPT DESIGNS WILL BE GENERATED TO SUPPORT PHASE II TESTING.

MISSION RESEARCH CORP. P.O. BOX 719 SANTA BARBARA, CA 93102 G.R. DANKER TITLE: COUNTERMEASURES DEVELOPMENT FOR DECOY CREDIBILITY T 1 OFFICE:	SDIO	\$ 49,963
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MISSION RESEARCH CORPORATION PROPOSES A PHASE I SBIR EFFORT IN WHICH

FISCAL YEAR 1986

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INNOVATIVE ANTI-DISCRIMINATION CONCEPTS WILL BE FORMULATED TO ENHANCE THE CREDIBILITY OF REENTRY VEHICLE DECOYS FOLLOWING EXPOSURE TO RADIATION ENVIRONMENTS FROM SELECTED ABM SYSTEMS, INCLUDING CONVENTIONAL NUCLEAR AND ADVANCED SDI-RELATED THREATS. IN ADDITION, THE FEASIBILITY OF THESE CONCEPTS WILL BE DETERMINED IN TERMS OF THEIR EFFECTIVENESS AND THEIR COMPATIBILITY WITH DECOY DESIGNS AND NON-SURVIVABILITY-RELATED PERFORMANCE REQUIREMENTS. FORMULATION OF ANTI-DISCRIMINATION CONCEPTS WILL RELY ON PROVEN ANALYTICAL TECHNIQUES TO CALCULATE THE CRITICAL RESPONSES OF RVs AND DECOYS DURING AND AFTER EXPOSURE TO RADIATION ENVIRONMENTS FROM SELECTED ABM THREATS. SUCCESSFUL DEVELOPMENT OF THESE CONCEPTS WILL ENHANCE THE EFFECTIVENESS OF U.S. BALLISTIC MISSILE SYSTEMS WHICH MUST OPERATE AGAINST PBV DEPLOYMENT AND MIDCOURSE DEFENSE SYSTEMS WHICH SEEK TO EXPLOIT THE LONG FREE FLIGHT PHASE OF BALLISTIC FLIGHT TO DISCRIMINATE BETWEEN INCOMING REENTRY OBJECTS FOR LATER ENGAGEMENT BY KINETIC ENERGY, DIRECTED ENERGY, OR CONVENTIONAL NUCLEAR WEAPONS. THE PROPOSED PHASE I EFFORT WILL CULMINATE IN THE PREPARATION OF A PROGRAM PLAN FOR FURTHER ANALYSES AND DEVELOPMENT/VERIFICATION TESTING IN PHASE II.

MISSION RESEARCH CORP.	SDIO	\$ 50,017
P.O. DRAWER 719		
SANTA BARBARA, CA 93102		
ROBERT D. EISLER, PHD		
TITLE:		
NON-PARASITIC DESIGN CONCEPTS FOR INTRINSIC HARDNESS OF COMPOSITE MOTORCASES		
T 7	OFFICE:	

THE RESPONSE OF DAMAGED COMPOSITE STRUCTURE IS NOT WELL UNDERSTOOD RESULTING IN VERY CONSERVATIVE DESIGN PRACTICES WHICH INCREASE STRUCTURAL WEIGHT AND DO NOT FULLY EXPLOIT THE ENHANCED PERFORMANCE OF THESE MATERIALS. COUPLED WITH THIS IS THE OBSERVATION THAT ALTHOUGH COMPOSITE STRUCTURES YIELD IMPROVED PERFORMANCE UNDER BENIGN LOADS THEY ARE NEVER-THE-LESS VERY SENSITIVE TO CERTAIN FORMS OF FINITE AREA DAMAGE (E.G., IMPACT EVENTS). IN FACT, AS THE PERFORMANCE OF COMPOSITE MATERIALS IS IMPROVED FOR BENIGN LOAD STATES RESULTING IN DECREASED WALL THICKNESSES; IT CAN BE SHOWN THAT THE VULNERABILITY OF THESE STRUCTURES TO FINITE AREA DAMAGE INCREASES DRAMATICALLY. FURTHER, IT IS PRECISELY THOSE CHARACTERISTICS LEADING TO ENHANCED PERFORMANCE UNDER BENIGN LOADS--HIGHER SPECIFIC STIFFNESS, HIGHER SPECIFIC STRENGTH, AND ENHANCED ANISOTROPY--THAT LEAD TO

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>DECREASED DAMAGE TOLERANCE OF COMPOSITE STRUCTURES. THIS PROPOSAL DISCUSSES OPTIMIZATION OF CURRENT MOTORCASES DESIGNS AND NON-PARASTIC IN SITU CONCEPTS WHICH CAN GREATLY INCREASE THE DAMAGE TOLERANCE OF COMPOSITE STRUCTURES WITH OUT SIGNIFICANTLY AFFECTING BENIGN PERFORMANCE. THE DESIGN CONCEPTS INCLUDE LOOKING AT OPTIMUM STACKING SEQUENCES, WIND ANGLES, AND PHASE GEOMETRIES. NON-PARASTIC CONCEPTS INCLUDE LOOKING AT HYBRID MATERIALS AND NEW PLY GEOMETRIES.</p>		

MISSION RESEARCH CORP. P.O. DRAWER 719 SANTA BARBARA, CA 93102 STEVEN F. STONE, PHD TITLE: LABORATORY DEVELOPMENT OF RUBBER-ENHANCED AND HYBRID FIBER-REINFORCED RESIN MATRIX SYSTEMS T 11 OFFICE:	SDIO	\$ 50,013
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MISSION RESEARCH CORPORATION (MRC) PROPOSES AN SBIR PHASE I EFFORT WHICH WILL INITIATE THE DEVELOPMENT OF A HIGH-TEMPERATURE CURE, LOW SHRINKAGE RESIN MATRIX SYSTEM WHICH RETAINS OR HAS IMPROVED MECHANICAL AND PHYSICAL PROPERTIES COMPARED TO THE BASELINE UNMODIFIED RESIN SYSTEM. THIS MATRIX WILL ALLOW FOR THE DEVELOPMENT OF TOUGHENED COMPOSITE COMPONENTS TO BE FORMED INTO COMPLEX SHAPES WITH MINIMAL FIBER DAMAGE WHICH WILL BE SUITABLE FOR COMPOSITE STRUCTURE APPLICATIONS. MRC WILL DEVELOP THIS MATERIAL BY ENHANCING COMMERCIALY AVAILABLE RESIN COMPONENTS WITH ELASTOMERS AND HIGH MODULUS HYBRID FIBERS. THE PHASE I EFFORT WILL INCLUDE RESIN, ELASTOMER, AND FIBER REQUIREMENTS DEFINITION, SELECTION, AND FORMULATION DEVELOPMENT. LABORATORY SPECIMENS WILL BE FABRICATED AND TESTS PERFORMED TO EVALUATE THE IMPROVED PERFORMANCE AND TO COMPARE THE MEASURED PROPERTIES WITH COMMERCIALY AVAILABLE TOUGH RESINS. PHASE II WILL CONTINUE THIS MATERIAL DEVELOPMENT AND WILL FOCUS ON THE FABRICATION AND IMPACT TESTING OF SMALL-SCALE COMPOSITE STRUCTURES FILAMENT WOULD WITH THIS IMPROVED RESIN.

MISSION RESEARCH CORP. 1720 RANDOLPH RD, SE ALBUQUERQUE, NM 87106 ALAN H. PAXTON, PHD TITLE: NOVEL RESONATOR FOR FREE-ELECTRON LASER: SIMULATION AND EXPERIMENT T 1 OFFICE:	SDIO	\$ 66,011
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A COMPUTER CODE TO SIMULATE SHORT-WAVELENGTH (SINGLE-PARTICLE-

FISCAL YEAR 1986

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INTERACTION DOMAIN) FREE ELECTRON LASER (FELs), INCLUDING ALL THE IMPORTANT PROPERTIES OF THEIR INTERACTIONS WITH UNSTABLE OPTICAL RESONATORS, WILL BE DEVELOPED. THIS CODE WILL BE APPLIED TO A NOVEL CLASS OF UNSTABLE RESONATOR THAT HAS A COMPACT OUTPUT BEAM. THIS CLASS OF UNSTABLE RESONATOR IS ESPECIALLY WELL ADAPTED TO THE FEL BECAUSE, UNLIKE CONVENTIONAL UNSTABLE RESONATORS, IT IS PRACTICAL FOR USE WITH A LASER THAT HAS LOW ROUND-TRIP GAIN.

MMR TECHNOLOGIES INC 1400 STIERLIN RD - #A-5 MOUNTAIN VIEW, CA 94043 HERBERT J EDMAN	NAVY	\$ 50,000
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## TITLE:

DESIGN AND FABRICATION OF A 20K FAST COOLDOWN MICROMINIATURE COOLER  
T 131 OFFICE: NAVAIR/NWC

A DESIGN STUDY IS PROPOSED TO DETERMINE AN OPTIMUM THERMODYNAMIC CYCLE FOR A FAST COOLDOWN JOULE-THOMSON MICROMINIATURE REFRIGERATOR FOR OPERATION OF 20K AND BELOW WHICH WILL MAINTAIN AN EXTREMELY UNIFORM TEMPERATURE DIFFERENCE ACROSS THE COLD STAGE. IT IS PROPOSED TO DESIGN AND FABRICATE A MINIATURE COOLER TO MEET THESE SPECIFICATIONS AND TO CHARACTERIZE ITS PERFORMANCE AT 20K AND BELOW.

MODULAR SOFTWARE SYSTEMS 33 GRAND CANYON LOS ALAMOS, NM 87544 GARY P CORT	NAVY	\$ 50,000
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## TITLE:

A CONFIGURABLE AUTOMATED LIBRARIAN FOR COMPUTER SOFTWARE SOURCE CODE

T 98 OFFICE: NSWC/DL

COORDINATION OF THE SHARING OF SOURCE CODE IN MEDIUM- TO LARGE-SCALE SOFTWARE DEVELOPMENT PROJECTS POSES A DIFFICULT PROBLEM IN THE ABSENCE OF A SOURCE CODE LIBRARIAN SYSTEM. UNFORTUNATELY, SYSTEMS OF THIS TYPE, WHILE POWERFUL AND FLEXIBLE, GENERALLY REQUIRE A LEVEL OF EXPERTISE AND COMMITMENT NOT COMMONLY FOUND IN THE APPLICATIONS CODE DEVELOPER. IN AN ATTEMPT TO ADDRESS THIS PROBLEM, THIS PROPOSAL SEEKS TO SPECIFY AN ENVIRONMENT CONSTRUCTED UPON COMMERCIALY AVAILABLE SOFTWARE COMPONENTS TO PROVIDE AN AUTOMATED SOFTWARE SOURCE CODE

FISCAL YEAR 1986

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<p>LIBRARIAN. THE ENVIRONMENT IS SUPPLEMENTED WITH A SET OF SOFTWARE TOOLS TO SUPPORT TRANSPARENT INTERACTION (SUBJECT TO ACCESS CONTROLS) BY MEMBERS OF THE DEVELOPMENT COMMUNITY. OTHER TOOLS ENABLE SOFTWARE MANAGERS TO CONFIGURE THE ENVIRONMENT (DEFINE INTERNAL STRUCTURES AND SET ACCESS CONTROLS). THE GOAL OF THIS RESEARCH IS TO DEFINE A POWERFUL, FLEXIBLE, CONFIGURABLE SOFTWARE LIBRARIAN WHICH IS COST-EFFECTIVE TO OPERATE AND MAINTAIN, WHICH IMPOSES MINIMAL OVERHEADS UPON PROJECT PARTICIPANTS AND WHICH IS COMPLETELY INDEPENDENT OF SOURCE CODE IMPLEMENTATION LANGUAGE. AS THE FIRST AND ONLY SUCH ENVIRONMENT TO BE MADE GENERALLY AVAILABLE, THIS AUTOMATED LIBRARIAN HAS THE POTENTIAL TO SIGNIFICANTLY IMPACT THE PRODUCTIVITY AND QUALITY OF SOFTWARE DEVELOPMENT PROJECTS HOSTED ON A WIDE RANGE OF COMPUTERS AND OPERATING SYSTEMS.</p>		

MODUSPEC CO PO BOX 63 - 534 BOSTON POST RD WAYLAND, MA 01778 JACK M GOLDSTEIN TITLE: TOXIC GAS DETECTOR T 180 OFFICE: TECOM/AVDTA	ARMY	\$ 50,400
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A TOXIC GAS DETECTOR IS DESCRIBED THAT DEPENDS UPON OPTICAL TECHNIQUES FOR ALL GASES MONITORED. SPECTROSCOPIC PROPERTIES OF THE GASES IN THE INFRARED REGION ARE USED TO SPECIFY EACH OF FIVE GASES TO BE DETECTED, AND THESE GASES ARE MEASURED IN A SINGLE MULTI-REFLECTIVE MEASUREMENT PHOTOMETER. GASES ARE DISTINGUISHED BY SPECTRAL CORRELATION TECHNIQUES, INVOLVING THE INTERACTIVE USE OF A SELF-CONTAINED MICROPROCESSOR. THE UNIT IS INTENDED TO BE SMALL IN SIZE AND PORTABLE. GASES WOULD BE SAMPLED BY A PUMP, AND THE UNIT IS INTENDED TO BE USED IN AIRCRAFT COCKPITS.

MOHR & ASSOCS 1440 AGNES ST RICHLAND, WA 99352 DR CHARLES L MOHR TITLE: A UNIVERSAL AUTOMATIC SYSTEM FOR THE INSPECTION OF 5.56MM THROUGH 50 CALIBER CARTRIDGE BRASS CUP DIMENSIONS AND HARDNESS T 33 OFFICE: ARDC/SMCAR	ARMY	\$ 49,992
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THE U.S. ARMY'S SMALL CALIBER AMMUNITION MODERNIZATION PROGRAM

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
<p>(SCAMP) CARTRIDGE BRASS (70/30) CUP INSPECTION IS CURRENTLY A MANUAL PROCESS THAT IS BASED ON THE DIMENSIONAL AND HARDNESS (OR GRAIN SIZE) MEASUREMENTS OF SAMPLES FROM EACH CUP LOT. IN THIS PROPOSED WORK, TESTING WITH LABORATORY MOCKUPS WOULD EVALUATE THE MOST PROMISING SENSING TECHNIQUES FOR THE MEASUREMENT OF CUP DIMENSIONS AND HARDNESS. HIGH-SPEED MEASUREMENT OF DIMENSIONS WILL BE EVALUATED USING NON-CONTACT OPTICAL, EDDY CURRENT AND CAPACITANCE SENSING AS WELL AS WITH CONTACT LVDT BASED SENSORS. BRASS HARDNESS IS COMPLICATED BY THE SENSITIVITY OF BRASS TO WORK HARDENING. HOWEVER, HARDNESS WILL BE EVALUATED WITH A COMBINATION OF EDDY CURRENT SENSORS AND HIGH-SPEED INDENTATION HARDNESS SENSING SUCH AS ROCKWELL AND BRINNEL TECHNIQUES. EXPERIMENTAL TESTS WOULD BE COMPLETED THAT WOULD ESTABLISH AN EMPIRICAL BASIS FOR HARDNESS AND DIMENSIONAL SENSORS. A CONCEPTUAL SYSTEM DESIGN WILL THEN BE DEVELOPED IN WHICH THE MOST PROMISING SENSORS ARE INTEGRATED WITH A CUP HANDLING SYSTEM AND INTERCHANGEABLE TOOLING TO MEASURE 5.56mm THROUGH 50 CALIBER CUPS. A PROTOTYPE SYSTEM WOULD BE DEVELOPED IN A FOLLOW-ON PHASE 2 PROJECT, BASED ON THIS CONCEPTUAL SYSTEM DESIGN.</p>		

MOSAIC TECHNOLOGIES INC  
47 MANNING RD  
BILLERICA, MA 01821  
TIMOTHY A ANDREWS

NAVY

\$ 48,279

## TITLE:

AN OBJECT-ORIENTED ENGINEERING DESIGN DATABASE  
T 7 OFFICE: ONR

A DATABASE MODEL WHICH PROVIDES A UNIQUE LEVEL OF SUPPORT FOR ENGINEERING DESIGN AND MANUFACTURING IS PROPOSED. ENGINEERING DESIGN APPLICATIONS HAVE VERY DIFFERENT DATA MANAGEMENT REQUIREMENTS THAN GENERAL BUSINESS APPLICATIONS, E.G., HANDLING SEVERAL DIFFERENT KINDS OF DATA EFFICIENTLY: GRAPHICS, AND SOLID GEOMETRIES AS WELL AS TRADITIONAL RECORD-ORIENTED DATA. MODELING SEVERAL DIFFERENT VIEWS OF COMPONENT HIERARCHIES. MODELING ALTERNATIVE VERSIONS OF DESIGNS. MODELING THE PARTIAL CONSISTENCY WHICH IS CHARACTERISTIC OF EVOLVING DESIGNS. THE DATA PROPOSED IS OBJECT-BASED NOT RECORD OR TUPLE BASED, AND IS HIGHLY EXTENSIBLE. A KEY ELEMENT IN EXTENSIBILITY IS THE DISTINCTION DRAWN BETWEEN THE SPECIFICATION OF A TYPE AND ITS REPRESENTATION, ALLOWING CUSTOM REPRESENTATIONS TO BE DEFINED FOR DIFFERENT TYPES OF DATA: 2D AND 3D GRAPHICS, GEOMETRY, SOLIDS MODELS, MATRIX-BASED ANALYSIS/SIMULATION DATA, CARTOGRAPHIC DATA,



FISCAL YEAR 1986

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DIGITIZED IMAGES, TEXT, AND VOICE -- REPRESENTATIONS WHICH ARE HIGHLY EFFICIENT FOR THESE TYPES OF DATA.

MRM ENGINEERS 918 PARK AVE PITTSBURGH, PA 15234 S G SHANKAR TITLE: PHASE SHIFTER T 47	AF	\$ 47,826
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OFFICE: RADC/XPX

SOL GEL TECHNOLOGY WILL BE EMPLOYED TO FABRICATE FERRITE PHASE SHIFTERS ON MAGNESIUM TITANATE DIALECTRICS. EXPERIMENTAL CONDITIONS FOR THE GROWTH OF FERRITES ON MAGNESIUM TITANATE WILL BE OPTIMIZED DURING PHASE I. THESE CONDITIONS INCLUDE CONCENTRATIONS OF STARTING SOLUTIONS, THE ACIDITY OF THE SOLUTION, TEMPERATURE OF GELATION AND HEATING/SINTERING SCHEDULES. THE MICROSTRUCTURES OF THE FABRICATED FERRITES WILL BE EXAMINED AND INITIALLY ANALYZED TO IDENTIFY THE RELATIONSHIP BETWEEN PROPORATIVE CONDITIONS AND THE RESULTANT PRODUCT. THE PERFORMANCE OF THESE DEVICES WILL BE EVALUATED.

MSNW INC PO BOX 865 SAN MARCOS, CA 92069 DR GEORGE H REYNOLDS TITLE: CORROSION MECHANISMS IN DISCONTINUOUS SiC/Al METAL MATRIX COMPOSITES T 113	NAVY	\$ 48,858
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OFFICE: NSWC

RESEARCH ON A NEW EXPERIMENTAL TECHNIQUE FOR DETERMINING THE MECHANISMS OF CORROSION IN METAL MATRIX COMPOSITES IS PROPOSED. THE TECHNIQUE PROVIDES THE REQUIRED HIGH RESOLUTION FOR THE STUDY OF THE ROLE OF INDIVIDUAL PHASES AND MICROSTRUCTURAL CONSTITUENTS IN THE INITIATION AND PROPAGATION OF LOCALIZED CORROSION PHENOMENA. USING SiC/Al AS A MODEL SYSTEM, HIGH RESOLUTION SURFACE ANALYSIS TECHNIQUES WILL BE USED FOR CHARACTERIZATION OF MICROSTRUCTURE, SURFACE OXIDE FILM MORPHOLOGY AND COMPOSITION INCLUDING FILM DISCONTINUITIES, AND COMPOSITIONAL MAPPING OF THE UNDERLYING ALLOY BEFORE CORROSION TESTING. AFTER AQUEOUS CORROSION TESTING FOR VARIOUS TIMES, THE SAME

FISCAL YEAR 1986

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AREAS OF THE MICROSTRUCTURE OF EACH TEST SAMPLE WILL BE LOCATED AND RECHARACTERIZED BY THE HETEROGENEITIES IN THE OBSERVED LOCALIZED CORROSION PHENOMENA. THE NOVEL TECHNIQUE APPEARS TO HAVE WIDE APPLICABILITY TO THE HIGH RESOLUTION STUDY OF CORROSION MECHANISMS IN HETEROGENEOUS MATERIALS. THE PROPOSED RESEARCH WILL BE PERFORMED BY MSNW, INC. WITH THE ENGINEERING AND TECHNICAL ASSISTANCE OF LOCKHEED-PALO ALTO RESEARCH LABORATORY AS A SUBCONTRACTOR TO ASSIST IN HIGH RESOLUTION SURFACE ANALYSIS STUDIES.

MSNW INC PO BOX 865 SAN MARCOS, CA 92069 DR GEORGE H REYNOLDS TITLE: THRESHOLD CORROSION FATIGUE OF WELDED SHIPBUILDING STEELS T 47 OFFICE: NAVSEA	NAVY	\$ 48,393
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DEVELOPMENT OF AN ACCELERATED TEST METHODOLOGY FOR NEAR-THRESHOLD CORROSION FATIGUE TESTING OF WELDED SHIPBUILDING STEELS IS PROPOSED. MIL S-24645 CLASS 3 HSLA STEEL WILL BE USED FOR INITIAL DEMONSTRATION OF THE TECHNIQUE. PRE-TEST MATERIALS CHARACTERIZATION WILL INCLUDE MICROSTRUCTURAL FEATURES AND ELECTROCHEMICAL BEHAVIOR. PHASE 1 NEAR-THRESHOLD CORROSION FATIGUE TESTS WILL BE PERFORMED ON BASE METAL SPECIMENS IN SYNTHETIC SEAWATER AT 0 DEG AND 20 DEG F AT THE FREE CORROSION POTENTIAL AND TWO LEVELS OF CATHODIC PROTECTION FOR A SINGLE TEST TEMPERATURE. POST-TEST CHARACTERIZATION OF CORROSION FATIGUE TEST SPECIMENS WILL ATTEMPT TO RELATE OBSERVED MICROSTRUCTURAL FEATURES AND CORROSION PRODUCTS TO TEST VARIABLES AND CORROSION FATIGUE PROCESS MECHANISTICS. SUBMERGED ARC AND PULSED GAS METAL ARC WELDING PROCEDURES WILL BE DEVELOPED TO PROVIDE WELDMENT TEST SPECIMENS SUITABLE FOR ISOSTRUCTURAL CRACK PROPAGATION CORROSION FATIGUE TESTS OF WELD METAL AND HEAT AFFECTED ZONES IN PHASE 2.

MSNW INC PO BOX 865 SAN MARCOS, CA 92069 DR GEORGE H REYNOLDS TITLE: EFFECT OF RESIDUAL ELEMENTS ON THE WELDABILITY OF ARMOR STEELS T 125 OFFICE: LABCOM/MTL	ARMY	\$ 49,993
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A SYSTEMATIC STUDY OF THE EFFECT OF CONTROLLED RESIDUAL AND

FISCAL YEAR 1986

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<p>INTENTIONAL ALLOYING ADDITONS AND WELDING PREHEAT ON THE WELDABILITY OF MIL-A-12560 ARMOR IS PROPOSED. BASELINE MATERIAL WILL BE COMMERCIAL HEAT OF MIL-A-12560. MULTIPLE LABORATORY SCALE HEATS WILL BE PREPARED WITH CONTROLLED LEVELS OF RESIDUAL AND INTENTIONAL ALLOYING ELEMENTS AND PROCESSED TO PLATE FOR WELDABILITY STUDIES. WITH WELDING PREHEAT AS A VARIABLE, WELDABILITY TESTS TO BE PERFORMED ON THE BASELINE AND EXPERIMENTAL MATERIALS INCLUDE AUTOGENOUS GTAW AND GMAW WELDS, AND IMPLANT TESTS FOR DELAYED CRACKING SUSCEPTIBILITY RESTRAINT AND TESTS AND STRESS RELIEF CRACKING SUSCEPTIBILITY TESTS. INTENSIVE POST-WELD AND POST-TEST CHARACTERIZATION WILL BE USED TO ESTABLISH THE INTERRELATIONSHIPS BETWEEN RESIDUAL ELEMENTS, PREHEAT AND WELDABILITY PERFORMANCE OF MIL-A-12560 ARMOR. THE PROJECT WILL BE PERFORMED BY MSNW, INC. WITH THE ENGINEERING AND TECHNICAL ASSISTANCE OF PHOENIX STEEL AND LEHIGH UNIVERSITY AS SUBCONTRACTORS.</p>		

MSNW INC PO BOX 865 SAN MARCOS, CA 92069 DR GEORGE H REYNOLDS TITLE: LONG-LIFE NON-SKID COATINGS FOR FLIGHT AND HANGAR DECKS T 189                      OFFICE: NSRDC	NAVY	\$ 47,444
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RESEARCH ON IMPROVED THERMALLY SPRAYED ALUMINUM NON-SKID COATINGS IS PROPOSED. THE IMPROVED COATINGS ARE ALUMINUM-ALUMINUM OXIDE METAL MATRIX COMPOSITES RATHER THAN PURE ALUMINUM. COMPARED TO CONVENTIONAL THERMALLY SPRAYED PURE ALUMINUM COATINGS, THE COMPOSITES HAVE DEMONSTRATED HIGHER HARDNESS AND BOND STRENGTH AND ARE EXPECTED TO DEMONSTRATE IMPROVED WEAR RESISTANCE AND INCREASED FRICTION COEFFICIENT AND CORROSION RESISTANCE. A SYSTEMATIC STUDY WILL BE PERFORMED TO PRODUCE PURE ALUMINUM COATINGS AS A BASELINE AND THE IMPROVED ALUMINUM-ALUMINUM OXIDE COMPOSITE COATINGS BY BOTH POWDER SPRAY AND ARCH WIRE SPRAY. PROCESS PARAMETERS TO BE INVESTIGATED INCLUDE SURFACE PREPARATION TECHNIQUES, BOND COATS, OXIDE PHASE LOADING (COATING COMPOSITION) AND THERMAL SPRAY METHOD. EVALUATION OF THE EXPERIMENTAL COATINGS WILL BE BY MEANS OF METALLOGRAPHIC EXAMINATION, HARDNESS/MICROHARDNESS MEASUREMENTS, BOND STRENGTH MEASUREMENTS AND STATIC/DYNAMIC FRICTION TESTING.

MUFFOLETTO OPTICAL CO INC 6100 EVERALL AVE BALTIMORE, MD 21206 DR JAMES A DOWLING TITLE: REQUIREMENTS AND SPECIFICATIONS FOR A SPACE-QUALIFIED ULTRA-VIOLET SURVEILLANCE TELESCOPE DEVELOPMENT T 49                      OFFICE: RADC/XPX	AF	\$ 49,899
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A RESEARCH AND DEVELOPMENT PROGRAM IS PROPOSED WHICH WILL DEFINE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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REQUIREMENTS FOR A PROTOTYPE ULTRAVIOLET (UV) SPACE-BASED SURVEIL-  
LANCE SYSTEM. A PLAN IS DESCRIBED WHICH WILL DEVELOP ESTIMATED  
VALUES FOR UV BACKGROUND AND TARGET SIGNATURE RADIATION LEVELS.  
THESE VALUES WILL BE USED AS A BASIS FOR SELECTION OF UV TELESCOPE  
DESIGN PARAMETERS. A SMALL SCALE BRASSBOARD MODEL OF THE PROPOSED  
TELESCOPE WILL BE CONSTRUCTED AND USED TO VERIFY PERFORMANCE PRE-  
DICTIONS.

MURDOCK INC 15800 S AVALON BLVD COMPTON, CA 90220 PETER N COMLEY TITLE: SPF PROPELLANT TANK RESEARCH PROPOSAL T 148 OFFICE: NWSC	NAVY	\$ 48,580
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TITANIUM PROPELLANT TANKS ARE CURRENTLY MANUFACTURED BY FORGING AND  
MACHINING SEGMENTS WHICH ARE THEN WELDED TOGETHER. IT IS THE OBJECT  
OF THIS RESEARCH PROPOSAL TO INVESTIGATE THE POSSIBILITY OF SUPER-  
PLASTICALLY FORMING HEMISPHERICAL TANK HEADS IN ONE OPERATION. THE  
RESEARCH SHALL INCLUDE: 1) AN EXAMINATION OF THE SCOPE OF THE RE-  
QUIREMENTS, SUCH AS TANK SIZE, MATERIAL SPECIFICATIONS, WALL THICK-  
NESSES AND WALL THICKNESS VARIATIONS. 2) A COMPUTER ANALYSIS OF A  
SUPERPLASTICALLY FORMING HEMISPHERICAL BUBBLE TO DETERMINE OPTIMUM  
PRESSURE AND TIME CHARACTERISTICS OF THE FORMING PROCESS, TOGETHER  
WITH A THEORETICAL THICKNESS PROFILE ACROSS THE PART. 3) CON-  
STRUCTION OF A HEMISPHERICAL DIE OF APPROXIMATELY 6" DIA TO REPRESENT  
A TYPICAL PART. 4) INVESTIGATION INTO PRE OR POST FORMED CHEMICAL  
MILLING OPERATIONS TO OBTAIN UNIFORMITY OF WALL THICKNESS. 5)  
ESTABLISHMENT OF FORMING PROCEDURE, VARIATIONS, OPERATING LIMITS  
OF STRAIN RATE, TEMPERATURE ETC. BY FORMING A NUMBER OF TANKS. 6)  
CREATION OF A FORMING AND INSPECTION SPECIFICATION.

MYERS LABS PO BOX 6477 SAN JOSE, CA 95150 PETER H MYERS TITLE: AIRCRAFT BINAURAL AUDITORY TRACKING SYSTEM - AIRBATS(tm) T 95 OFFICE: ASD/XR	AF	\$ 0
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MYERS LABORATORIES IS CURRENTLY DEVELOPING A NEW DISPLAY TECHNOLOGY,

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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KNOWN AS AIRBATS(tm) - AIRCRAFT BINAURAL AUDITORY TRACKING SYSTEM. AIRBATS(tm) UTILIZES THE HUMAN AUDITORY SYSTEM'S ABILITY TO LOCALIZE THE DIRECTION AND DISTANCE OF A SOUND SOURCE. MYERS LABORATORIES' AIRBATS(tm) TECHNOLOGY WILL MIMIC THE HUMAN AUDITORY LOCALIZATION SYSTEM, BY COMPUTER EMULATION OF THE NATURAL BINAURAL AUDITORY SIGNAL PROCESSING (BIONIC EMULATION). THE RESULTING AIRBATS(tm) TECHNOLOGY WILL BE IN THE FORM OF A BLACK BOX, WHICH CAN PROCESS, UNDER COMPUTER CONTROL, ANY INPUTTED ELECTRONIC SOUND AND "PLACE" THE LOCATION OF THE SOUND OUT AROUND THE OBSERVER, AT ANY SPECIFIED POINT IN THREE-DIMENSIONAL SPACE. AIRBATS(tm) WILL CREATE THE POTENTIAL FOR A NEW TYPE OF AVIONICS INFORMATION DISPLAY. THE INFORMATION DISPLAY WILL EXPLOIT THE HUMAN AUDITORY PERCEPTUAL SYSTEM, RATHER THAN THE OVERLY TAXED VISUAL PERCEPTION SYSTEM. IN AN AIRCRAFT, THIS MEANS THE MORE INFORMATION CAN BE PERCEIVED AND COMPREHENDED BY THE PILOT'S BRAIN AT ANY ONE TIME - RESULTING IN SUPERIOR MAN-MACHINE INTERFACE. DURING THE PHASE I AWARD, MYERS LABORATORIES WILL PROVIDE AUDITORY PROOF THAT SOUNDS CAN BE ARTIFICALLY PROCESSED AND DISPLAYED THREE-DIMENSIONALLY AND THAT IT IS FEASIBLE TO CREATE THE AIRBATS(tm) AVIONICS DISPLAY TECHNOLOGY.

MYK TECHNOLOGY INC 1140-P CENTRE DR CITY OF INDUSTRY, CA 91789 DR YU-WEN CHANG TITLE: MILLIMETER WAVE ELECTRONIC SCAN ANTENNAS - NEW CONCEPT T 78 OFFICE: LABCOM/ETDL	ARMY	\$ 48,512
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GaAs MONOLITHIC ELECTRONIC PHASE SHIFTERS ARE PROPOSED FOR 35 GHZ TO 94 GHZ APPLICATIONS. TWO DIMENSIONAL PLANAR ARRAY CONFIGURATIONS ARE POSSIBLE WITH THESE MONOLITHIC PHASE SHIFTERS.

MYK TECHNOLOGY INC 1140-P CENTRE DR CITY OF INDUSTRY, CA 91789 DR YU-WEN CHANG TITLE: FOCAL PLANE MM IMAGER FOR INSTRUMENTATION T 157 OFFICE: TECOM/YPG	ARMY	\$ 49,941
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PLACING MULTIPLE DETECTOR ARRAY AT THE FOCAL PLANE OF A REFLECTOR

FISCAL YEAR 1986

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ANTENNA CAN INCREASE ANGULAR RESOLUTION ON TARGET. A HETERODYNE MIXER DETECTION SCHEME IS PROPOSED WITH THE MIXER DIODE ARRAY PUMPED BY A COMMON LOCAL OSCILLATOR. SUM/DIFFERENCE PHASE DETECTION WILL ALLOW THE RESOLUTION OF MORE THAN ONE TARGET IN THE BEAM. THE MIXER BEAM LEAD DIODES WILL BE ON A COMMON CIRCUIT BOARD WITH THEIR I.F. OUTPUTS THROUGH A BUNDLE OF TINY COAXIAL CABLES. THE ARRAY WILL HAVE A MUCH HIGHER DETECTION SENSITIVITY COMPARED WITH THE USE OF BOLOMETERS OR CRYSTAL VIDEO DETECTORS.

MYSTECH ASSOCS INC

NAVY

\$ 46,955

PO BOX 220

MYSTIC, CT 06355

DR CAROL A DAVIS

TITLE:

AN EXPERT SYSTEM DECISION AID FOR THE TRAINING TASK SELECTION PROCESS

T 166

OFFICE: NAVSEA/NTEC

THE TRAINING TASK SELECTION PROCESS IS AN IMPORTANT ELEMENT OF TRAINING PROGRAM ANALYSIS. CURRENT TASK SELECTION METHODOLOGY IS OFTEN INADEQUATE BECAUSE IT DEPENDS ON SUBJECTIVE INPUT, IS TIME-CONSUMING IF CONSCIENTIOUSLY APPLIED, AND FAILS TO INCORPORATE RELEVANT TASK INFORMATION AND EXPERTISE. AN EXPERT SYSTEM DECISION-AIDING DEVICE WHICH WOULD AUTOMATE THE TASK SELECTION PROCESS WOULD ELIMINATE SHORTCOMINGS IN THE EXISTING METHODOLOGY. IT WOULD CENTRALIZE RELEVANT INFORMATION AND EXPERTISE IN AN ORGANIZED DATABASE AND FORMALIZE TASK SELECTION PROCEDURES. AS A RESULT, THE TASK SELECTION PROCESS WOULD BE LESS SUBJECTIVE, LESS TIME-CONSUMING, AND CONSEQUENTLY, MORE EFFECTIVE IN DEFINING TASKS FOR TRAINING. THE PROPOSED RESEARCH EFFORT WILL EXAMINE VARIED SOURCES OF INFORMATION SUGGESTING POTENTIAL TASK SELECTION CRITERIA AND PROCEDURES, AND FROM THIS DATA, WILL CHOOSE APPROPRIATE SYSTEM FEATURES. A TASK SELECTION PROCEDURE WILL BE DESIGNED FOR THE EXPERT SYSTEM DECISION AID, AND THE SYSTEM OUTPUT AND MAN-MACHINE INTERFACE WILL BE IDENTIFIED. A SYSTEM PROTOTYPE CONTAINING A LIMITED NUMBER OF CRITERIA AND RESTRICTED PROCEDURES WILL BE BUILT TO EXAMINE THE APPROPRIATENESS OF THE SYSTEM FEATURES AND DESIGN, AND THE OVERALL FEASIBILITY OF THE TASK SELECTION DECISION AID.

N.A.T. DEVELOPMENT INC

DNA

\$ 75,000

PO BOX 2486

WESTFORD, MA 01886

NOEL A TOOHER

TITLE:

NUCLEAR HARDENING AND SURVIVABILITY

T

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OFFICE: AM/SBIR

N.A.T. DEVELOPMENT HAS DEVELOPED A THREE PART APPROACH TO ACHIEVE EMP

FISCAL YEAR 1986

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SHIELDING IN NEW AND USED EQUIPMENT THAT PROVIDES SUPERIOR ECONOMICS, AS WELL AS IMPROVED PHYSICAL PROPERTIES. THE GOALS AND OBJECTIVES OF THE PROJECT FOLLOW. 1) OPTIMIZATION OF THE RHEOLOGICAL/APPLICATION PROPERTIES OF 'STATE OF THE SCIENCE' CONDUCTIVE COATINGS. THESE SYSTEMS COMBINE THE EMP CONDUCTIVE EFFICIENCIES OF SILVER AND/OR GOLD WITH GLASS SPHERES AND/OR HOLLOW GLASS BEADS TO OBTAIN A COATED MATERIAL WITH EMP CONDUCTIVE PROPERTIES EQUAL TO SILVER AND/OR GOLD FILLED MATRIX SYSTEMS AT APPROXIMATELY ONE-SEVENTH THE LOADING, WITH SUPERIOR PERFORMANCE, DENSITY AND VOLUME CONCENTRATIONS TO ACHIEVE EMP RESISTANT COATINGS TECHNOLOGY THAT CAN BE COST EFFECTIVELY APPLIED DIRECTLY TO NEW AND/OR USED EQUIPMENT, FACILITIES, CONCRETE AND WALLS. 2) INCORPORATION AND STABILIZATION OF THESE MATERIALS TO ACHIEVE EMP RESISTANT COATINGS THAT CAN BE APPLIED DIRECTLY TO FABRIC OR OTHER SUITABLE SUBSTRATE, TO CREATE, A PORTABLE EMP SHROUD (AS IN SBIR '85 #93 ARMY), A EMP WALLCOVERING (SBIR '86 #5 DNA) OR EMP "FREE" ZONE WITH > 90db ATTENUATION. 3) THE LAST PROJECT EFFORT IS TO FORMALLY EVALUATE AND REPORT ON COMPARATIVE CURRENT 'SCIENCE' ON LOW COST ELECTROMAGNETIC SHIELDING SYSTEMS. PHYSICAL PROPERTIES OF THE EVALUATED CONDUCTIVE SYSTEMS SHALL CRITERIA 'QUALITY SHIELDING' (>>0 db-ATTENUATION [ATTAINABLE BY (SILVER/SILVER-FILLERS] SEE TESTING/CONTACTS). THIS WILL SET PRIORITY AND OPTIMIZED THE DATA BASE EFFECTIVENESS OF THE EVALUATION.

NDT TECHNOLOGIES INC	NAVY	\$ 49,995
PO BOX 637 - 150 STRONG RD		
SOUTH WINDSOR, CT 06074		
DR HERBERT R WEISCHEDEL		
TITLE:		
CONSTANT TENSION SPOOLING DEVICE FOR WIRE ROPE AND CABLE		
T 185	OFFICE: NSRDC	

EXPLORATORY DESIGN AND DEVELOPMENT OF A CONSTANT TENSION SPOOLING DEVICE IS PROPOSED. SUCH EQUIPMENT PROVIDES SMOOTH TRANSFER OF WIRE ROPE AND ELECTRO-MECHANICAL CABLES FROM SHIPPING SPOOLS ONTO THE SHIP AS WELL AS AIDING IN DISTRIBUTING CONSTRUCTIONAL STRETCH THROUGHOUT THE WHOLE CABLE LENGTH. THE SPOOLING DEVICE MUST BE SIMPLE, COMPACT, LIGHT CRANE PORTABLE, AND SELF POWERED. THE OBJECTIVES OF THE PHASE I EXPLORATORY EFFORT ARE: (i) TO DEMONSTRATE FEASIBILITY OF SUCH EQUIPMENT, AND AFTER FEASIBILITY IS ESTABLISHED, (ii) TO DETERMINE AN OPTIMUM DESIGN OF A CONSTANT TENSION SPOOLING DEVICE. DESIGN AND TRADE-OFF STUDIES WILL BE EMPHASIZED TO ACHIEVE THE OBJECTIVES. A

FISCAL YEAR 1986

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<p>SET OF PERFORMANCE SPECIFICATIONS REFLECTING THE REQUIREMENTS OF THE US NAVY WILL FIRST BE DETERMINED. THEN, USING THESE SPECIFICATIONS, THE PROPOSED DESIGN AND TRADE-OFF STUDIES WILL CONSIDER AND OPTIMIZE THE MECHANICAL CONFIGURATION OF THE REELING SYSTEM, ITS POWER DRIVES, AND ITS MOTION AND OPERATING CONTROL SYSTEMS. VERY SIMPLE AS WELL AS SOPHISTICATED OPTIONS WILL BE CONSIDERED. BESIDES SIMPLE APPROACHES, THESE OPTIONS INCLUDE MICROPROCESSOR BASE "SMART" MOTION AND OPERATING CONTROL SYSTEMS TOGETHER WITH ELECTRIC, HYDRAULIC OR PNEUMATIC DRIVES, EITHER SEPARATELY OR IN COMBINATIONS. FINALLY, A PRELIMINARY DESIGN OF THE CONSTANT TENSION SPOOLING DEVICE WILL BE PRESENTED.</p>		

NEVADA ENGINEERING & TECHNOLOGY CORP 2225 E 28TH ST - BLDG 511 LONG BEACH, CA 90806 SAMUEL W BRADSTREET TITLE: BEHAVIOR OF METAL MATRIX COMPOSITES AT CRYOGENIC TEMPERATURES T 112 OFFICE: NSWC	NAVY	\$ 49,743
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MMC ARE VIABLE CANDIDATES FOR SATELLITE AND SPACECRAFT STRUCTURES. THEIR PROPERTIES AND BEHAVIOR AT THE LOW TEMPERATURES EXPERIENCED IN LOW-EARTH OR GEOCENTRIC ORBITS OR FOR DEEP SPACE MISSIONS ARE INADEQUATELY KNOWN. NETCO PROPOSES TO OBTAIN THESE DATA UTILIZING SPECIMENS OF A Gr/Al UNIDIRECTIONAL FIBER-REINFORCED COMPOSITE. PRELIMINARY NON-DESTRUCTIVE METHODS FOR CHARACTERIZING PANEL-TO-PANEL AND SPECIMEN-TO-SPECIMEN VARIABILITY WILL FIRST BE UNDERTAKEN, AND A SMALL NUMBER OF SPECIMENS WILL BE TESTED AT RT 20.0 DEG C) FOR LONGITUDINAL AND TRANSVERSE STRENGTHS, DYNAMIC AND STATIC MODULI, AND STRAINS TO FAILURE IN TENSION AND COMPRESSION. WET CHEMICAL ANALYSIS WILL BE OBTAINED. HALF THE REMAINING SPECIMENS WILL BE IMMersed ONCE OR MORE TIMES IN LN(2) AND AGED TO T6. THERE WILL BE COMPLETE CHARACTERIZATION AND HALF OF THEM WILL BE STATICALLY TESTED AT RT WITH PARTICULAR CARE BEING TAKEN TO DETERMINE THE ELASTIC LIMITS IN LONGITUDINAL TENSION AND COMPRESSION. THE REMAINING T6 SPECIMENS WILL BE TESTED FOR CTE(L) IN THE RANGE OF RT-LN(2)-RT, AND A SMALL NUMBER STATICALLY TESTED IN THE LN(2) TEMPERATURE (-195.8 DEG C).

NEW TECHNOLOGY INC 4811 BRADFORD BLVD HUNTSVILLE, AL 35805 L J BRADFORD TITLE: LOW COST WEAPON FAMILY CONCEPT FOR GUERRILLA WARFARE T 31 OFFICE: AD/XRPT	AF	\$ 49,603
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THE PROBLEM OF STRIKING A GUERRILLA TARGET WITHOUT DESTRUCTION OF



FISCAL YEAR 1986

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AGRICULTURAL AND URBAN ASSETS RESTRICTS THE NUMBER OF WEAPONS AVAILABLE TO MILITARY PLANNERS. THIS EFFORT ADDRESSES THE FEASIBILITY OF USING AIR LAUNCHED HYPERVELOCITY ROCKETS (HVR'S) WITH MULTIPLE WARHEAD PENETRATORS TO DEFEAT GUERRILLA TROOPS AND EQUIPMENT. THE CONCEPT PROVIDES EFFECTIVE AIR-TO-GROUND ASSAULT CAPABILITY AGAINST GROUND VEHICLES, BUILDINGS, AND PERSONNEL WHEN FIRED FROM WING MOUNTED PODS ON FIGHTER AIRCRAFT. UNIQUE TO THE PROPOSED APPROACH IS THE SIMPLICITY OF ALLOWING A WEAPON MIX TO BE EMPLOYED ON A SINGLE AIR VEHICLE TO ENHANCE THE STRIKE CAPABILITY AGAINST UNEXPECTED TARGETS THAT MAY BE ENCOUNTERED. THE CONCEPT WILL ALSO PROVIDE AIR-TO-AIR DEFENSE AGAINST ENEMY FIXED WING AND ROTARY AIRCRAFT. DUE TO ITS SIMPLE NATURE THE SYSTEM WOULD BE INEXPENSIVE, TAMPERPROOF, AND IMMUNE TO EW COUNTERMEASURES. THE VERY SHORT TIME ON TARGET OF HYPERVELOCITY PROJECTILES DOES NOT ALLOW THE TARGET TO MANEUVER OR REACT.

NICHOLS RESEARCH CORP 4040 S MEMORIAL PKWY HUNTSVILLE, AL 35802 BARRY W BRYANT TITLE: ULTRAVIOLET (UV) SURVEILLANCE OPTICS T 49 OFFICE: RADC/DOR	AF	\$ 48,000
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NICHOLS RESEARCH CORPORATION PROPOSES TO INVESTIGATE THE MISSION REQUIREMENTS AND THE RESULTING UV SENSOR REQUIREMENTS FOR A SPACE SURVEILLANCE SYSTEM. FROM THESE, WE PROPOSE TO DERIVE THE OPTICAL REQUIREMENTS. THE OBJECTIVE OF THIS TOPIC IS TO PRODUCE AT LEAST ONE SPECIFICATION FOR A SPACE QUALIFIED UV OPTICAL TELESCOPE. THE WORK PLAN IS LAID OUT TO FOLLOW THESE STEPS IN LOGICAL ORDER. IN PHASE II WE WOULD PROPOSE TO FABRICATE AND TEST A SCALED-DOWN VERSION OF THE OPTICS WHICH COULD BE USED IN A FOLLOW-ON UV TARGET/BACKGROUND MEASUREMENTS PROGRAM.

NICHOLS RESEARCH CORP 4040 S MEMORIAL PKWY HUNTSVILLE, AL 35802 MICHAEL FLAHERTY TITLE: SOVIET CAPABILITIES FOR THE WEAPONIZATION OF DIRECTED ENERGY T 198 OFFICE: BMO/MYSC	AF	\$ 49,969
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THE SOVIET CAPABILITIES FOR THE WEAPONIZATION OF DIRECTED ENERGY

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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ASSESSMENT EFFORT DETAILED WITHIN WILL PROVIDE FOR AN INTELLIGENCE ASSESSMENT OF CURRENT AND PROJECTED SOVIET RF/PARTICLE BEAM/LASER TECHNOLOGY FOR USE WITHIN BALLISTIC MISSILE DEFENSE. SPECIFICALLY, THIS EFFORT WILL COMBINE INTELLIGENCE ANALYSIS IN THE AREAS OF BMD OPTIONS, WEAPON REQUIREMENTS, AND TECHNOLOGY ASSESSMENT OF DE WEAPON COMPONENTS. AN INTEGRATION OF RESULTS FROM ALL OF THE ABOVE ANALYSIS AREAS WILL CONTRIBUTE TO THE OVERALL ASSESSMENT. THE PHASE I EFFORT WILL, BY NECESSITY, RESTRICT THE ASSESSMENT TO A MOSCOW BMD SYSTEM. THE PHASE II FOLLOW-ON WILL THEN ADDRESS DE WEAPONS RESPONDING TO A SOVIET NATIONAL BMD.

NICHOLS RESEARCH CORP 4040 S MEMORIAL PKWY HUNTSVILLE, AL 35802 STEPHEN M FORCZYK TITLE: OPTICAL COUNTERMEASURES T 263	AF	\$ 49,955
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OFFICE: BMO/MYSC

THE EMERGING SOVIET BMD AND ASAT SYSTEMS OF THE 1990'S AND THE GREAT DISCRIMINATION POTENTIAL OF RADAR AND OPTICAL SENSORS USED IN CONCERT REQUIRE THE DEVELOPMENT OF PRACTICAL OPTICAL COUNTERMEASURE PENAIDS. THESE DEVICES MUST OPERATE IN A HOSTILE EXOATMOSPHERIC ENVIRONMENT IN THE PRESENCE OF NUCLEAR BURSTS. LIMITS ON US THROWWEIGHT DICTATE SMALL DEVICES CAPABLE OF OPERATING AFTER LONG PERIODS OF DORMANCY. DEVELOPMENTS IN OPTICS TECHNOLOGY MAKE LONG RANGE LWIR SURVEILLANCE SENSORS PRACTICAL NOW. IMAGING SENSORS ARE A DISTINCT POSSIBILITY IN THE 1990S. PENAIDS SELECTED FOR US VEHICLES MUST BE DESIGNED TO THIS THREAT. THREE SPECIFIC PENAIDS THAT HOLD PROMISE OF MEETING THESE CRITERIA ARE SET FORTH IN THIS PROPOSAL.

NICHOLS RESEARCH CORP 4040 S MEMORIAL PKWY HUNTSVILLE, AL 35802 DR WILLIAM H SCHOENDORF TITLE: ANTI-SIMULATION FOR PENETRATION AIDS T 270	AF	\$ 49,730
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OFFICE: BMO/MYSC

THE PROPOSED RESEARCH WILL EXAMINE THE ANTI-SIMULATION TACTIC BOTH

FISCAL YEAR 1986

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FROM THE STANDPOINT OF THE OFFENSE AND FROM THAT OF THE DEFENSE. THE OFFENSE POINT OF VIEW INCLUDES DETERMINING THE SIGNATURE FEATURES THAT THE ANTI-SIMULATION TACTIC ATTEMPTS TO DISGUISE AND THE DEGREE TO WHICH THESE FEATURES CAN BE MODIFIED BY PRACTICAL ALTERATIONS OF BOTH THE RV AND THE DECOY. THIS PORTION OF THE RESEARCH WILL ALSO ADDRESS IMPORTANT THEORETICAL AND PRACTICAL ISSUES SUCH AS HOW TO DETERMINE THE NUMBER AND THE DISTRIBUTION OF THE MULTIPLE CLASSES THAT RESULT FROM THE APPLICATION OF ANTI-SIMULATION AND HOW TO BEST IMPLEMENT THE TACTIC IN PRACTICE. THE DEFENSE POINT OF VIEW FOCUSES ON THE MOST EFFECTIVE STRATEGY THAT CAN BE EMPLOYED TO COUNTER THE TACTICS IN ORDER TO OBTAIN A QUANTITATIVE ESTIMATE OF ANTI-SIMULATION EFFECTIVENESS. PROCEDURES FOR COMBINING THE DATA FROM MULTIPLE SENSORS WILL BE DERIVED AND APPLIED TO BOTH EXO- AND ENDO-ATMOSPHERIC ENGAGEMENTS IN ORDER TO EVALUATE THE EFFECTIVENESS OF THE DEFENSE TACTIC IN A MULTI-SENSOR ENVIRONMENT AS A FUNCTION OF THE TYPE AND THE AMOUNT OF A-PRIORI INFORMATION AVAILABLE TO THE DEFENSE. RESULTS WILL BE ANALYZED TO DETERMINE THE CHARACTERISTICS THAT CONTAIN THE MOST POTENT DISCRIMINATION INFORMATION AND THESE WILL BE RELATED TO THE PHYSICAL PHENOMENA SO THAT THE APPLICABILITY OF THE TACTIC TO SPECIFIC SYSTEMS CAN BE ESTABLISHED.

NICHOLS RESEARCH CORP.  
4040 SOUTH MEMORIAL PKWY.  
HUNTSVILLE, AL 35802  
HERBERT E. HUNTER

SDIO \$ 49,983

## TITLE:

DEFINITION OF SOLAR RELATED BMD BATTLESPACE ENVIRONMENT THROUGH THE FIRST DECADE OF THE 21ST CENTURY

T 3 OFFICE:

THE ANALYSIS OF DISCRIMINATION FOR MIDCOURSE AND EARLY ENDOATMOSPHERIC BALLISTIC MISSILE DEFENSE (BMD), IS HIGHLY DEPENDENT UPON AN ACCURATE KNOWLEDGE OF PROPERTIES OF THE NEAR EARTH SPACE ENVIRONMENT WHICH ARE CORRELATED WITH SOLAR ACTIVITY. THIS PROJECT WILL PROVIDE 1) CORRELATION LAWS BETWEEN THE BMD BATTLESPACE ENVIRONMENT AND SOLAR ACTIVITY, 2) LONG TERM FORECASTS (20-25 YEARS) OF SOLAR ACTIVITY, AND 3) DEFINE POTENTIAL IMPROVEMENTS IN THESE CORRELATIONS AND FORECASTS BY APPLYING HIGH DIMENSIONAL ANALYSIS TECHNIQUES TO SUNSPORT AND AAMAGNETIC INDEX HISTORIES OBTAINED OVER THE FIRST 21 SOLAR CYCLES (1755-1985). THE HIGH DIMENSIONAL ANALYSIS TECHNIQUES, BASED ON PRECEDING THE ANALYSIS BY TRANSFORMATION TO THE APPROPRIATE EIGENVECTOR

FISCAL YEAR 1986

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SPACE WILL FIRST BE APPLIED USING PREVIOUSLY DEMONSTRATED TECHNIQUES TO FORECAST SOLAR ACTIVITY FOR SOLAR CYCLES 22 AND 23 (1985-2010). EXPLORATORY ANALYSIS WILL BE PERFORMED TO DEFINE THE POTENTIAL FOR IMPROVING THE FORECAST ACCURACY, CONFIDENCE, AND PERIOD TO BE PREDICTED BY 1) CONSIDERING VARIATIONS IN PREDICTORS, 2) FORMULATION OF PREDICTANTS, AND 3) INTRODUCTION OF NEW DATA. IMPROVED CORRELATION BETWEEN PARAMETERS OF INTEREST TO BMD AND SOLAR ACTIVITY WILL ALSO BE OBTAINED USING THE HIGH DIMENSIONAL ANALYSIS TECHNIQUES.

NICHOLS RESEARCH CORP. 4040 SOUTH MEMORIAL PKWY. HUNTSVILLE, AL 35802 EDWIN NUNEZ TITLE: EXPECTED EARTHSHINE DETERMINATION ON EXOATMOSPHERIC OBJECTS AND PENETRATION AIDS T 3 OFFICE:	SDIO	\$ 49,929
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A FSIGNIFICANT COMPONENT OF THE EXOATMOSPHERIC SIGNATURES OF MANY ELEMENTS OF A POTENTIAL BMD THREAT IS THE REFLECTED EARTHSHINE. THIS EARTHSHINE IS STRONGLY AFFECTED BY THE GROUND COVER AND METEOROLOGICAL CONDITIONS UNDER THE BATTLESPACE. THE PROPOSED PROJECT WILL DEMONSTRATE THE IMPROVEMENT WHICH IS POSSIBLE IN CALCULATING VISIBLE AND INFRARED EARTHSHINE VARIATIONS BY APPLYING NEW HIGH-DIMENSIONAL ANALYSIS TECHNIQUES TO A COMBINATION OF SATELLITE (EARTH RADIATION BUDGET EXPERIMENT) AND CONVENTIONAL METEROLOGICAL DATA. IT IS ANTICIPATED THAT THIS PROJECT WILL PROVIDE SIGNIFICANT IMPROVEMENTS OVER THE EARTHSHINE MODELLING CALCULATIONS IN THE OPTICAL SIGNATURES CODE. IN PHASE I, THE BEST EMPIRICAL APPROACH TO DERIVING ALGORITHMS FOR OBJECTS OVER POLAR AREAS AND CONTINENTAL U.S. UNDER CLEAR AND VERY CLOUDY CONDITIONS FOR A PARTICULAR SEASON WILL BE DEVELOPED. DURING PHASE II, DEMONSTRATION ALGORITHMS WILL BE DEVELOPED AND TESTED FOR ALL SEASONS, DIFFERENT GEOGRAPHICAL REGIONS AND WEATHER SITUATIONS OF BMD INTEREST.

NICHOLS RESEARCH CORP. 4040 SOUTH MEMORIAL PKWY. HUNTSVILLE, AL 35802 GREGORY R. MCNEILL TITLE: KINETIC ENERGY WEAPONS T 2 OFFICE:	SDIO	\$ 49,957
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THE ACQUISITION OF POST BOOST PHASE VEHICLES AND/OR INDIVIDUAL RE-

FISCAL YEAR 1986

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<p>ENTRY VEHICLES BY AN INFRARED SENSOR ON BOARD A SMALL G HARDENED PROJECTILE WHICH SUBSEQUENTLY HOMES ON AND IMPACTS ITS TARGET OFFERS AN ATTRACTIVE APPROACH FOR REENTRY VEHICLE KINETIC ENERGY KILL. THE ACQUISITION, TRACKING, DISCRIMINATION AND GUIDANCE FUNCTIONS REQUIRED OF SUCH AN IR SENSOR RESULT IN A NUMBER OF CRITICAL ISSUES. THE SENSOR ACQUISITION RANGE IS OF PRIMARY IMPORTANCE AND IF EXTENDED SIGNIFICANTLY CAN PROVIDE DRAMATIC PERFORMANCE IMPROVEMENT AND OVERALL SYSTEM COST REDUCTION. ACQUISITION RANGE IS LIMITED PRIMARILY BY HARD EARTH BACKGROUND (BOTH DC AND CLUTTER) AND THE DETECTION ALGORITHMS USED TO IDENTIFY TARGETS. SENSOR WAVEBAND OPTIMIZATION FOR REDUCING HARD EARTH BACKGROUND AS WELL AS EXTENDED MTI (MOVING TARGET INDICATOR) ALGORITHMS ARE PROPOSED FOR THIS INVESTIGATION. EXTENDING PROJECTILE ACQUISITION RANGE WILL INCREASE TOTAL DIVERT CAPABILITY SUBSEQUENTLY RELAXING BOTH HANDOVER ERROR VOLUME AND LAUNCHER POINTING ACCURACY REQUIREMENTS.</p>		

NICHOLS RESEARCH CORP. 4040 SOUTH MEMORIAL PKWY. HUNTSVILLE, AL 35802 KENNETH H. DENT TITLE: KINETIC ENERGY PROJECTILE LETHALITY ENHANCEMENT T 2 OFFICE:	SDIO	\$ 49,964
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A FEASIBILITY STUDY IS PROPOSED ON A NOVEL IDEA FOR A DESIGN OF A SEMI-SMART PROJECTILE FOR KINETIC ENERGY WEAPONS, AND IN PARTICULAR, EML WEAPONS. THE TECHNOLOGY FOR THIS DESIGN IS CURRENTLY AVAILABLE. IT WOULD BE INTRINSICALLY HARD TO THE 100000 G ACCELERATIONS EXPERIENCE BY AN EML PROJECTILE AND WOULD HAVE A GREATLY IMPROVED PROBABILITY OF HIT (AND KILL) OVER A CLASSICAL DUMB PROJECTILE AGAINST ICBM AND SLBM BOOSTERS.

NIELSEN ENGINEERING & RESEARCH INC 510 CLYDE AVE MOUNTAIN VIEW, CA 94043 DAVID NIXON TITLE: SUPERMANEUVER AERODYNAMICS STUDY T 1 OFFICE: AFOSR/XOT	AF	\$ 49,871
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THE PROPOSED WORK CONCERNS A NOVEL APPROACH TO THE STUDY OF AERODY-

FISCAL YEAR 1986

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NAMICS DURING TRANSIENT MANEUVERS. PREVIOUS WORK HAS SHOWN THAT AUGMENTED AERODYNAMIC CHARACTERISTICS, SUCH AS VERY HIGH LIFT COEFFICIENT, MAY BE OBTAINED DUE TO THE TRANSIENT NATURE OF SOME MANEUVERS. THE FLUID MECHANICS THAT AFFECT THESE DESIRABLE CHARACTERISTICS CAN BE COMPLEX AND DIFFICULT TO STUDY, DUE TO THEIR TRANSIENT NATURE, AND DUE TO THE COMBINATIONS OF PITCH, ROLL AND DECELERATION THAT MAY OCCUR. THIS PROPOSAL CONCERNS THE DEVELOPMENT OF A COMPUTATIONAL ANALYSIS TECHNIQUE FOR EXAMINING IMPORTANT SUB-ELEMENTS OF THE FLOW-FIELDS THAT ARISE DURING SUCH MANEUVERS. THE TECHNIQUE WILL DETERMINE THE CRITICAL FLUID MECHANISMS WHICH CONTROL THE FLOW IN THE SUB-ELEMENT. THE ULTIMATE OBJECTIVE IS TO EXAMINE METHODS OF EXISTING CONTROL OVER THE SUB-ELEMENT FLOWS, IN AN EFFORT TO ACHIEVE MORE DESIRABLE AERODYNAMIC CHARACTERISTICS.

NKF ENGINEERING INC 12200 SUNRISE VALLEY DR RESTON, VA 22091 RICHARD E BUTEUX TITLE: ELECTRICAL-MECHANICAL AUTOMATIC INFLATOR FOR LIFE PRESERVERS T 184 OFFICE: NSRDC	NAVY	\$ 49,972
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THE OBJECTIVE OF THE ELECTRO-MECHANICAL INFLATOR PROGRAM IS TO DEMONSTRATE THE FEASIBILITY OF A WATER ACTIVATED AUTOMATIC INFLATOR FOR LIFE PRESERVERS. IT WILL HAVE AN ELECTRICAL WATER IMMERSION CIRCUIT WHICH ACTIVATES A MECHANICAL DEVICE TO RELEASE CO(2) FROM THE CARTRIDGE. THE DEVICE IS TO HAVE THE LOW COST AND EASY MAINTENANCE CHARACTERISTICS OF SOLUBLE MATERIAL AUTOMATIC INFLATORS WITH THE HIGH RELIABILITY OF SQUID TYPE AUTOMATIC INFLATORS.

NKF ENGINEERING INC 12200 SUNRISE VALLEY DR RESTON, VA 22091 RODERICK BARR TITLE: GENERATION OF SHIP LIKE PRESSURE SIGNATURE USING A TOWED ARRAY T 159 OFFICE: NCSC	NAVY	\$ 49,996
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THE PROPOSED RESEARCH WILL INVESTIGATE THE USE OF A LINE ARRAY OF TOWED BODIES WITH HIGH-LIFT WINGS OR HYDROFOILS OPERATING NEAR THE

FISCAL YEAR 1986

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FREE SURFACE TO GENERATE TYPICAL SHIP-LIKE PRESSURE SIGNATURES WHICH CAN BE USED TO SAFELY DETONATE MINES DURING MINESWEEPING OPERATIONS. SUCH A SYSTEM MUST BE CAPABLE OF BEING DEPLOYED, TOWED, RETRIEVED, AND STOWED USING U.S. NAVY MINESWEEPERS SUCH AS THE MCM OR MSH. THE USE OF A LINE ARRAY OF PERHAPS TWO TO FOUR BALLASTABLE TOWED BODIES, IN WHICH SPACING OF THE BODIES CAN BE EASILY VARIED TO OPTIMIZE PERFORMANCE WITH CHANGES IN OPERATING CONDITIONS, AVAILABLE TOWED VESSEL TOW FORCE OR MINE SENSOR LOGIC, GIVES THIS SYSTEM GREAT POTENTIAL FLEXIBILITY. THE USE OF MULTIPLE BODIES SHOULD MAKE OPERATION FROM SHIPS SUCH AS THE MCM OR MSH POSSIBLE. THE STEPS TO BE FOLLOWED IN DEMONSTRATING THE CAPABILITY AND FEASIBILITY OF THE PROPOSED APPROACH ARE: 1) DETERMINATION OF TOW SPEED, ARRAY GEOMETRY AND TOWED BODY SIZE FOR GENERATION OF REQUIRED PRESSURE SIGNATURES; 2) DETERMINATION OF MINIMUM FEASIBLE SYSTEM DRAG AND COMPONENT SIZE AND WEIGHT; 3) A PRELIMINARY DETERMINATION OF THE FEASIBILITY OF OPERATION IN SIGNIFICANT SEA STATES; AND 4) A PRELIMINARY ASSESSMENT OF THE FEASIBILITY OF SHIPBOARD OPERATION OF SUCH A SYSTEM.

NORDTECH RESEARCH 53 CROMWELL FAIRFIELD, IA 52556 ERIK VIGMOSTAD TITLE: NON-CONTACTING TORQUE SENSOR T 119 OFFICE: TACOM/AMSTA	ARMY	\$ 48,818
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THE NON-CONTACTING TORQUE SENSOR WHICH WE PROPOSE TO BUILD WILL PROVIDE, FOR THE FIRST TIME, A LOW COST AND RELIABLE MEANS OF DETERMINING, IN REAL-TIME, TORQUE APPLIED TO ANY FERROMAGNETIC SHAFT. FOR ARMY VEHICLES, THE TORQUE SENSOR WOULD FIND USES IN DIAGNOSTIC STUDIES, BY PROVIDING DIRECT, ACCURATE MEASUREMENTS OF TORQUE. WITH THE ADDITION OF A RATE SENSING DEVICE (NOT PART OF THIS PROPOSAL), HORSEPOWER CAN ALSO BE DETERMINED IN REAL-TIME. THE PROPOSED TECHNIQUE, WHICH IS PROPRIETARY TO NORDTECH RESEARCH, HAS NEVER BEEN USED IN A TORQUE SENSING MECHANISM BEFORE.

NTS APPLIED RESEARCH 12511 BEATRICE ST. CULVER CITY, CA 90066 PAUL LIEBERMAN, PHD TITLE: HOLOGRAPHIC SPACE BASED MIRRORS T 1 OFFICE:	SDIO	\$ 97,272
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NATIONAL TECHNICAL SYSTEMS (NTS) APPLIED RESEARCH HAS BEEN SUCCESSFUL

FISCAL YEAR 1986

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IN FABRICATING SUPER HIGH EFFICIENCY HOLOGRAPHIC REFLECTION COATINGS WITH OPTICAL DENSITY OF A 6 FOR SPECIFIC BANDWIDTHS IN VISIBLE PORTION OF THE SPECTRUM. IN ADDITION NTS WAS ABLE TO EXTEND THESE HOLOGRAPHIC COATINGS INTO THE NEAR IR REGION OF THE SPECTRUM. THE HOLOGRAPHIC COATINGS ARE 20 MICROMETERS THICK AND HAVE EXTREMELY SMALL ABSORPTION. ELECTRON MICROGRAPHS HAVE SHOWN THE INDEX OF REFRACTION VARIATION WITH FILM DEPTH TO BE SINUSOIDAL. SEVERAL FILTER BANDWIDTHS CAN BE IMPRINTED IN THE SAME HOLOGRAM, I.E., A NATURAL RUGATE FILTER. THESE HOLOGRAPHIC COATINGS HAVE REFLECTIVE PROPERTIES THAT EXCEED THE BEST DIELECTRIC STACKS AT A PROJECTED COST OF FABRICATION THAT IS AN ORDER OF MAGNITUDE LESS THAN DIELECTRIC MIRRORS AND ARE LARGER IN AREA AND MORE INEXPENSIVE. THUS, THE POSSIBILITY OF USING THESE HOLOGRAPHIC COATINGS AS A LIGHT WEIGHT MIRROR IN BANDWIDTHS OF THE VISIBLE AND NEAR IR REGIONS SUGGESTS ITSELF. THE ABILITY TO REFLECT NARROW BAND REGIONS ( $\Delta\lambda \sim 20\text{nm}$ ) HAS BEEN DEMONSTRATED BY IMPINGEMENT WITH LOW POWER LASERS. SINCE THESE HOLOGRAPHIC COATINGS ARE FABRICATED WITH A LASER BEAM, THE ONLY LIMITATION TO FABRICATING LARGE AREAS ( $\sim \text{m}^2$ ), IS THE ABILITY TO DIVERGE THE LASER BEAM SO THAT IT IS STILL UNIFORM AND COHERENT OVER THE SURFACE OF THE HOLOGRAM.

NTS ENGINEERING  
6695 E PACIFIC COAST HWY  
LONG BEACH, CA 90803  
DR PAUL LIEBERMAN  
TITLE:

AF

\$ 74,047

ICBM DEEP BASING MISSILE LAUNCH MID AIR SEPARATION DEMONSTRATION  
DESIGN

T 244

OFFICE: BMO/MYSC

THIS ACTIVITY WILL DEFINE A LOW COST DEMONSTRATION TO BE USED AS A PROOF OF PRINCIPLE OF MID AIR SEPARATION STABILITY. THE LAUNCH DYNAMICS OF THE LAUNCH TUBE TO MISSILE CANISTER AND THE MISSILE CANISTER TO MISSILE IS A VERY COMPLEX TECHNICAL CHALLENGE. THIS IS ESPECIALLY TRUE WHEN THE LAUNCH ANGLE IS SIGNIFICANTLY DIFFERENT THAN VERTICAL, E.G. 45 DEG OFF VERTICAL. IN THIS PHASE A DETAILED ANALYSIS AND MODELING EFFORT WOULD BE CONDUCTED OF THE GAS DYNAMICS AND RESULTANT TUMBLING MOTION ASSOCIATED WITH OFF VERTICAL LAUNCH. ALL THE PREVIOUS RELATED WORK IN THIS AREA WOULD BE REVIEWED AS A BASIS FOR THE ANALYSIS. THE ICBM DEEP BASING GAS PROPELLED LAUNCHER FEASIBILITY DEMONSTRATION PROGRAM WOULD BE MONITORED FOR APPLICABLE DATA. IN



FISCAL YEAR 1986

SUBMITTED BY  
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PARTICULAR, THE ANALYSIS WOULD EXAMINE IN DETAIL A VARIETY OF OFF-VEHICLE LAUNCH DYNAMICS INCLUDING 45 DEG. THE RESULTS OF THE ANALYSIS WOULD BE THE BASIS TO LAYOUT A DETAILED TEST PLAN FOR PHASE II. THE PHASE II WOULD CONTAIN A LARGE AMOUNT OF TESTING ON A LARGE NTS CENTRIFUGE. THIS TESTING WOULD INCLUDE THE LAUNCH TUBE/CANISTER AND CANISTER/MISSILE DYNAMICS. THE REASON FOR THE CENTRIFUGE IS TO ENSURE THE EFFECTS OF GRAVITY ARE CORRECTLY ACCOUNTED FOR IN THE TEST SITUATION OF A SCALED VERSION OF HARDWARE. THIS TECHNIQUE COULD BUILD UPON/VERIFY THE RESULTS OF THE PHASE I WITHOUT REQUIRING EXPENSIVE FULL SCALE HARDWARE. THE PHASE II PLAN WOULD BE DEVELOPED AND COSTED AT THE COMPLETION OF PHASE I.

NU TECH  
5805 CHERRYWOOD LN - STE 302  
GREENBELT, MD 20770  
DR A P KOTHARI  
TITLE:  
COMPUTATIONAL OPTIMIZATION OF HYPERSONIC BODIES  
T 99 OFFICE: ASD/XR

AF \$ 49,589

NON-MECHANICAL METHODS FOR MODIFYING LOCAL FLOWFIELDS ON HYPERSONIC VEHICLES ARE INVESTIGATED. THESE INCLUDE LEADING EDGE SHAPE MODIFICATIONS AND WALL TEMPERATURE CONTROL. THE LONG RANGE GOAL IS TO BE ABLE TO APPLY SIMILAR TECHNIQUES TO THE DESIGN OF COMPLETE OPTIMIZED AEROSPACE VEHICLES. THIS WILL BE DONE USING A COMBINED EXPLICIT-IMPLICIT TIME DEPENDENT ALGORITHM AND THE NON-LINEAR SIMPLEX OPTIMIZATION TECHNIQUE OF NELDER AND MEAD. PARAMETERS SUCH AS THE LEADING EDGE SHAPE AND WALL TEMPERATURE DISTRIBUTION WILL BE VARIED TO FIND THE PROFILES THAT MAXIMIZE THE DESIRED FUNCTIONAL (L/D). THIS WILL BE PERFORMED AT VARIOUS MACH NUMBERS AND FREESTREAM CONDITIONS TO OBSERVE HOW THE OPTIMUM LEADING EDGE SHAPES CHANGE, IF AT ALL, WITH MACH NUMBER AND REYNOLDS NUMBER.

NUMERICAL COMPUTATION CORP  
22 MEADOW DR  
STONY BROOK, NY 11790  
YUNG MING CHEN

ARMY \$ 50,733

TITLE:  
EFFICIENT NUMERICAL ALGORITHM FOR SCATTERING OF ELECTROMAGNETIC WAVES BY COMPLEX OBJECTS  
T 155 OFFICE: LABCOM/BRL

THE ABILITY TO COMPUTE EFFICIENTLY THE SCATTERED ELECTROMAGNETIC

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>WAVES (RADAR CROSS SECTION) BY A TARGET WITH COMPLEX GEOMETRY AND MATERIAL PROPERTY (INCLUDING ANISOTROPY, FINITE CONDUCTIVITY, ETC.) PLAYS A VERY IMPORTANT ROLE IN ADVANCED VULNERABILITY ANALYSIS FOR ANY POSTULATED AIRCRAFT. HENCE THE DEVELOPMENT OF AN EFFICIENT AND VERSATILE NUMERICAL ALGORITHM FOR SOLVING THIS TYPE OF COMPLEX EM SCATTERING PROBLEMS IS DEFINITELY IN DIRE NEED. IT IS PROPOSED TO ACHIEVE THIS BY USING A SPECIAL FINITE DIFFERENCE METHOD BASED UPON A NATURAL SPATIAL DISCRETIZATION OF THE INTEGRAL FORM OF MAXWELL'S EQUATIONS ON A NON-ORTHOGONAL GRID-SYSTEM AND THE LEAD-FROG FINITE DIFFERENCING IN THE TIME DOMAIN. IT HAS THE ADVANTAGES OF BEING (a) MORE EFFICIENT THAN ANY OTHER KNOWN NUMERICAL METHODS, (b) HIGHLY ACCURATE DUE TO THE BODY-FITTED GRID-SYSTEM, AND (c) THE EASIEST NUMERICAL METHODS TO IMPLEMENT ANY BOUNDARY CONDITIONS. IF THERE IS A NEED, FAST FOURIER TRANSFORM OF THE CORRESPONDING RESULTS IN THE TIME DOMAIN. THE PHASE I EFFORTS ARE TO DEVELOP THE ABOVE-MENTIONED EFFICIENT NUMERICAL ALGORITHM FOR SOLVING TWO-DIMENSIONAL SCATTERING PROBLEMS AND TO DEMONSTRATE ITS CAPABILITY BY SOLVING MANY REALISTIC EXAMPLES.</p>		

OCEAN & ATMOSPHERIC SCIENCE INC 145 PALISADE ST DOBBS FERRY, NY 10522 ROSS E WILLIAMS TITLE: HIGH RESOLUTION ARRAY DESIGN T 155	NAVY	\$ 49,293
OFFICE: NAVSEA/NUSC		

SEVERAL TECHNIQUES ARE PROPOSED FOR EXTREMELY HIGH RESOLUTION ARRAY PROCESSING OF SIGNALS EMANATING FROM A SUBMERSIBLE THAT TRANSITS IN CLOSE PROXIMITY TO A RECEIVING ARRAY. AN ITERATIVE METHOD IS SUGGESTED FOR PROCESSING RECORDED DATA IN WHICH MATCHED FILTERS ARE TAILORED TO EACH OF MANY CLOSELY SPACED NOISE SOURCES. BEAMFORMING WEIGHTS ARE ASSIGNED TO SENSORS SIMULTANEOUSLY TO MAXIMIZE THE MAIN LOBE RESPONSE TO A PARTICULAR SIGNAL OF INTEREST, NARROW THIS LOBE WIDTH, DIRECT BEAM NULLS TO ALL OTHER NOISE SOURCES, AND COHERENTLY SUBTRACT CONTRIBUTIONS FROM ALL OTHER NOISE SOURCES AT THE MATCHED FILTER OUTPUT FOR THE SIGNAL OF INTEREST. THIS PROCEDURE IS OPTIMUM FOR MAXIMIZING SIGNAL-TO-NOISE RATIO AND ANGULAR RESOLUTION SIMULTANEOUSLY. CONVENTIONAL ADAPTIVE BEAMFORMING FOR NULL-STEERING AND SIGNAL WAVEFRONT COMPENSATION (E.G. IN THE NEAR FIELD) WILL ALSO BE COMPARED AND EVALUTATED, AS WILL PASSIVE SYNTHETIC APERTURE AND MULTI-

FISCAL YEAR 1986

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PLICATIVE BEAMFORMING TECHNIQUES. INCREASED RESOLUTION THROUGH IN-COHERENT POST-DETECTION PROCESSING WILL BE EXAMINED. APPROPRIATE CHOICES WILL BE MADE FOR SENSORS WITH LOW SELF-NOISE, GOOD SENSITIVITY AND APPRECIABLE DEPTH CAPABILITY, AND A SENSOR ARRAY DESIGN WILL BE PROVIDED. AN OPTIMUM SIGNAL PROCESSING METHOD WILL BE CHOSEN, AND ULTIMATE PERFORMANCE OF THE ARRAY AND PROCESSOR WILL BE ESTIMATED.

OCI

AF

\$ 49,812

1349 N ELIZABETH  
FERGUSON, MO 63135  
HENRY J OVERAL

TITLE:

LANDING GEAR LINKAGES-SOFT PINS WITH HARD BUSHINGS

T 146 OFFICE: AFWAL/FI

THE USE OF HARD BUSHINGS (FOR SUSTAINING LOADS AND WEAR) TOGETHER WITH PIVOT PINS INCORPORATING AN OUTER BEARING MATERIAL IN LANDING GEAR LINKAGES WILL BE DESIGNED, ANALYSED AND TEST VERIFIED. THE PROGRAM WILL DEMONSTRATE THAT SUCH A FRICTION PAIR ARRANGEMENT IS FEASIBLE AND PRACTICAL.

ODETICS INC

ARMY

\$ 50,000

1515 S MANCHESTER AVE  
ANAHEIM, CA 92802  
ALAN ROHRBACHER

TITLE:

ROBOTIC CONTROL SYSTEM FOR A ROBOTIC HOWITZER

T 1 OFFICE: ARDC/SMCAR

THE INTEGRATED SMART ARTILLERY SYNTHESIS (ISAS) ROBOTIC HOWITZER IS BEING DEVELOPED BY THE ARMY (ARDC) AS PROOF-OF-PRINCIPAL HARDWARE AND TO SERVE AS A DESIGN AND DEVELOPMENT TESTBED. THE ISAS ROBOTIC HOWITZER HAS DEMONSTRATED THAT AUTONOMOUS BATTLE MANAGEMENT IS FEASIBILITY. A KEY COMPONENT OF THE ISAS HOWITZER IS A PROTOTYPE AMMUNITION HANDLING SYSTEM DESIGNATED THE ISAS ROBOTIC ARM-GANTRY. THE PROTOTYPE AUTOLOADER HAS DEMONSTRATED FUNCTIONAL CAPABILITY TO PHYSICALLY MANEUVER AND PERFORM ITS REQUIRED TASKS. HOWEVER, THESE FUNCTIONS ARE CURRENTLY LIMITED TO 99 PREPROGRAMMED ROUTINES WHICH ARE ACTIVATED BY AN ALLEN-BRADLEY 8200 CONTROLLER. IN ADDITION, THE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>CONTROLLER AND THE FIRE CONTROL SYSTEM FUNCTION INDEPENDENTLY, THUS RESTRICTING THE ADAPTABILITY OF THE HOWITZER TO A CHANGING ENVIRONMENT AND REQUIRING A LARGE DATA BASE OF PROGRAMMED ROUTINES. THIS PROPOSED WORKSCOPE SEEKS TO UPGRADE THE SYSTEM BY DEFINING AND VALIDATING A SYSTEM CONTROLLELR CONCEPT WHICH WILL PERFORM ALL THE FUNCTIONS CURRENTLY BEING PERFORMED BY THE FIRE CONTROL SYSTEM AND THE ROBOT SYSTEM AS AN UATONOMOUSLY INTEGRATED SYSTEM.</p>		
ODETICS INC 1515 S MANCHESTER AVE ANAHEIM, CA 92802 ROBERT DRAP TITLE: LASER NAVIGATION FOR TACTICAL ROBOTIC VEHICLES T 113 OFFICE: TACOM/AMSTA	ARMY	\$ 50,000

RELIABLE AND ASSURED MEANS OF POSITION DETERMINATION IS NEEDED FOR TACTICAL ROBOTIC VEHICLES. ROBOTIC PILOTAGE TECHNIQUES SUCH AS LASER SCANNING CN ACCOMPLISH OBSTACLE AVOIDANCE AND SHORT RANGE PATH PLANNING. DEAD RECKONING TECHNIQUES CAN HANDLE DLONGER TERM NAVIGATION, HOWEVER, DRIFT AND ERROR BUILDUP DEVELOP OVER TIME WHICH CAN CAUSE LOSS OF THE CRITICAL POSITION REFERENCE. THIS STUDY WILL INVESTIGATE THE USE OF TERRAIN CORRELATION USING LASER RANGEFINDER INPUTS AS A MEANS OF UP-DATING ON-BOARD NAVIGATION SYSTEMS FOR TACTICAL ROBOTIC VEHICLES. PHASE I WILL DEVELOP AND TEST COMPUTER SIMULATIONS, AND ASSESS THE FEASIBILITY AND CONCEPT FOR A PHASE II HARDWARE DEMONSTRATION.

OHRN ENTERPRISES INC 719 E GENESEE ST SYRACUSE, NY 13210 SHIKHA SEN GUPTA TITLE: GENERATION OF HIGH VOLTAGE SUBNANOSECOND ELECTRICAL PULSES T 3 OFFICE: ONR	NAVY	\$ 49,015
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COMMERCIALY AVAILABLE SUBNANOSECOND ELECTRICAL PULSERS SUFFER FROM TWO LIMITATIONS: LOW VOLTAGE LEVELS AND/OR CONSIDERABLE PULSE TO PULSE JITTER. A PULSER WHICH OVERCOME THESE LIMITATIONS WOULD OPEN UP NEW AVENUES OF RESEARCH IN DIVERSE AREAS, ESPECIALLY IN HIGH RE-

FISCAL YEAR 1986

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AWARDED

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SOLUTION RADAR AND RADAR TARGET IDENTIFICATION VIA NATURAL RESONANCE EXTRACTION; A HIGH ENERGY SOURCE FOR MICROWAVE GENERATION; A FAST EFFICIENT SWITCH IN mm WAVE APPLICATION AND IN THE DEVELOPMENT OF A TIME DOMAIN RADAR. THE OBJECTIVE OF THIS WORK IS TO DEMONSTRATE THE POSSIBILITY OF A WORKING LABORATORY MODEL OF AN ELECTRICAL PULSER CAPABLE OF GENERATING KILOVOLT AMPLITUDE PULSES OF 100 PICOSECOND OR LESS AT A REPETITION RATE OF 500 Hz. WE PROPOSE TO ACHIEVE THIS BY UTILISING A Q-SWITCHED MODE LOCKED LASER TO CONTROL A SEMICONDUCTOR SWITCH CONNECTED TO A HIGH VOLTAGE LINE. IT IS DEMONSTRATED THAT IT IS POSSIBLE TO GENERATE 1kv PULSES IN 250-350 PICOSECONDS DURATION AT A REPETITION RATE OF 500 Hz. THE AMPLITUDE JITTER IN THE PULSES ARE VERY SMALL AND FOR THE FIRST TIME SUCH PULSES CAN BE VIEWED ON A SAMPLING SCOPE. THE PROPOSAL OUTLINES VARIOUS WAYS OF REDUCING PULSE WIDTHS FOR EXISTING LASER SYSTEMS. ALTERNATE APPROACHES OF ACHIEVING THE SAME GOAL WITH LASER DIODES IS ALSO OUTLINED.

OPCOA INC  
1202 N BROADWAY  
SANTA ANA, CA 92701  
DR WILLIMA H QUICK

AF

\$ 49,776

## TITLE:

TURBINE ENGINE TEST INSTRUMENTION USING FIBER-OPTIC TEMPERATURE SENSOR

T 179

OFFICE: AFWAL/PO

WITH THE RECENT, RAPID ACCELERATION IN THE GROWTH OF FIBER OPTIC TRANSMISSION SYSTEMS, IT SEEMS LOGICAL THAT ALL-OPTICAL SENSORS WILL BE THE NEXT GENERATION OF SENSORS -- NOT JUST FOR TEMPERATURE AND PRESSURE BUT FOR A VARIETY OF PARAMETERS, INCLUDING STRESS, DISPLACEMENT, LIQUID LEVEL, ETC. TO DEMONSTRATE THE OPTICAL SENSOR CONCEPT, A TEMPERATURE SENSOR WILL BE DESIGNED AND FABRICATED FOR APPLICATION IN THE EMP/EMI, HIGH-TEMPERATURE CONDITIONS OF TURBINE ENGINE TEST INSTRUMENTATION. THE SENSOR CONSISTS OF A BROADBAND LIGHT SOURCE COUPLED INTO AN OPTICAL FIBER WHICH TRANSMITS THIS BROADBAND SPECTRUM TO THE REMOTE SENSOR ELEMENT. THE SENSOR ELEMENT IS A VARIABLE GAP FABRY-PEROT CAVITY WHICH MODULATES THE REFLECTED SPECTRUM ACCORDING TO GAP DIMENSION. THE REFLECTED SPECTRUM IS FIBER-TRANSMITTED BACK TO A MICROPROCESSOR BASED, COLOR DEMODULATION SYSTEM. THIS COLOR DEMODULATION IS ACCOMPLISHED BY PRISM DISPERSION OVER A CHARGE-COUPLED-DEVICE (CCD). THE MICROPROCESSOR USES KALMAN FILTERING TO ANALYZE AND CONVERT THE SPECTRAL DATA TO TEMPERATURE.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
OPCOA INC 1202 N BROADWAY SANTA ANA, CA 92701 DR WILLIAM H QUICK TITLE: ELECTRO-OPTIC HYBRID SENSOR FOR CONTINUOUS AIR QUALITY MONITORING T 192 OFFICE: CERL/COE	ARMY	\$ 49,982

THE DEVELOPMENT OF A MINIATURE, SIMPLE, INEXPENSIVE IR SPECTROPHOTOMETER WILL FIND APPLICATION IN ANY SITUATION WHERE CONTINUOUS AIR QUALITY MONITORING IS DESIRED. OPCOA PROPOSES TO APPLY HYBRID, MICEO-ELECTRO-OPTICS TO THE VARIOUS COMPONENTS OF THE VARIOUS COMPONENTS OF AN IR SPECTROPHOTOMETER NOT ONLY TO REDUCE THE SIZE AND POWER REQUIREMENT OF THE SYSTEM BUT ALSO TO ENHANCE SENSITIVITY AND RELIABILITY. USING AN ELECTRICALLY TUNABLE FABRY-PEROT FILTER INSTEAD OF THE CONVENTIONAL ROTATING GRATING OR FILTER WHEEL, AN OPTICAL FIBER INTERNAL OR EVANESCENT PROPAGATING FIELD INSTEAD OF A SAMPLE CHAMBER, AND A SEMICONDUCTOR COOLED IR DETECTOR INSTEAD OF A PYROELECTRIC DETECTOR WILL EXPLOIT RECENTLY DEVELOPED TECHNOLOGIES FOR THE SYSTEM DEVELOPMENT. THE FIBER OPTIC, FORMING THE ABSORPTION PATH CAN BE WRAPPED ABOUT A SOLID-STATE-REFRIGERATOR COOLED SHAFT ALLOWING CONDENSATION (AND HENCE DETECTION) OF AEROSOLS AND PARTICULATE MATTER ON THE FIBER SURFACE. THE ENTIRE SYSTEMS IS CONTROLLED BY AND HAS ITS ANALYSIS (KALMA FILETER) PERFORMED BY A MICROPROCESSOR.

OPCOA INC 1202 N BROADWAY SANTA ANA, CA 92701 DR WILLIAM H QUICK TITLE: FIBER-OPTIC INFRARED SPECTROPHOTOMETER WITH MICROPROCESSOR ANALYSIS AND CONTROL T 2 OFFICE: ONT	NAVY	\$ 49,982
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THE DEVELOPMENT OF A MINIATURE, SIMPLE, INEXPENSIVE IR SPECTROPHOTOMETER WILL PROVIDE A MEANS OF CHEMICAL SENSING AND MEASUREMENT FOR APPLICATION IN DRUG DETECTION, TOXIC WASTE MANAGEMENT, AND CABIN ATMOSPHERE MONITORING. OPCOA PROPOSES TO APPLY MICRO-ELECTRO-OPTICS TO THE VARIOUS COMPONENTS OF THE VARIOUS COMPONENTS OF AN IR SPECTRO-

FISCAL YEAR 1986

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PHOTOMETER NOT ONLY TO REDUCE THE SIZE AND POWER REQUIREMENTS OF THE SYSTEM BUT ALSO TO ENHANCE SENSITIVITY AND RELIABILITY. USING AN ELECTRICALLY TUNABLE FABRY-PEROT FILTER INSTEAD OF THE CONVENTIONAL ROTATING GRATING OR FILTER WHEEL, AN OPTICAL FIBER INTERNAL OR EVANESCENT PROPAGATING FIELD INSTEAD OF A SAMPLE CHAMBER, AND A SEMICONDUCTOR COOLED IR DETECTOR INSTEAD OF A PYROELECTRIC DETECTOR WILL EXPLOIT RECENTLY DEVELOPED TECHNOLOGIES FOR THE SYSTEM DEVELOPMENT. THE ENTIRE SYSTEM IS CONTROLLED BY AND HAS ITS ANALYSIS (KALMAN FILTER) PERFORMED BY A MICROPROCESSOR.

OPTELECOM INC 15930 LUANNE DR GAITHERSBURG, MD 20877 RON SMITH TITLE: MOBILE ROBOT SECURE/AJ DATA LINKS T 122 OFFICE: NSWC	NAVY	\$ 49,938
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THE TECHNOLOGY TO ALLOW REPLACEMENT OF PERSONNEL BY MOBILE ROBOTS IN HIGH RISK SITUATIONS EXISTS TODAY. THE NEAR TERM APPROACH, NOT REQUIRING EXTENSIVE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE REQUIRES USE OF A BROAD BANDWIDTH SECURE, ANTI JAM COMMUNICATIONS LINK TO ALLOW MAN-IN-THE-LOOP OPERATION. THIS PROGRAM PROPOSES TO STUDY THE MAKE-UP OF SUCH LINKS FOR SHORT, INTERMEDIATE AND LONG RANGE ROBOTIC MISSIONS; TO SELECT CONFIGURATIONS FOR FURTHER STUDY; AND TO ESTIMATE DEVELOPMENT PROGRAM COSTS AND SCHEDULE AND PRODUCTION COSTS OF SELECTED LINKS. RECOMMENDED FOLLOW-ON EFFORT BASED ON THESE STUDIES WILL BE DEFINED.

OPTELECOM INC 15930 LUANNE DR GAITHERSBURG, MD 20877 RON SMITH TITLE: LINK ELECTRONICS FOR ROBOTIC VEHICLE ENHANCEMENTS T 113 OFFICE: TACOM/AMSTA	ARMY	\$ 49,991
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THE TECHNOLOGY TO ALLOW REPLACEMENT OF PERSONNEL BY MOBILE ROBOTS IN HIGH RISK SITUATIONS IS AVAILABLE TODAY. THE ROBOTICS APPROACH SUITABLE FOR MOST IMMEDIATE DEPLOYMENT IS TO USE THE ROBOT AS AN

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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EXTENSION OF HUMAN MUSCLE AND SENSING, AND TO USE THE HUMAN BRAIN BY MEANS OF A HIGH BANDWIDTH FIBER OPTIC LINK. THIS PROPOSAL ADDRESSED THE NEED TO DEFINE AN OPTIMUM LINK ARCHITECTURE FOR FIBER OPTIC LINK ELECTRONICS TO BE USED FOR ROBOTIC APPLICATIONS. PROPOSED WORK INCLUDES STUDY OF MULTIPLEXING FORMAT AND COMPUTER INTERFACE ARCHITECTURE. BUILDING ON RELATED EXISTING HARDWARE, OPTELECOM OFFERS THE OPPORTUNITY TO PROGRESS TO THE STAGE OF A BREADBOARD PROTOTYPE DURING THE PHASE I EFFORT.

OPTICAL TECHNOLOGIES INC 360 HERNDON PKWY - STE 1200 HERNDON, VA 22070 DR CHARLES M DAVIS TITLE: REMOTE EM SENSOR TECHNOLOGY T 48 OFFICE: NAVSEA	NAVY	\$ 49,903
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THE U.S. NAVY IS SEEKING AN ELECTROMAGNETIC (EM) FIELD SENSOR CAPABLE OF OPERATION IN THE FREQUENCY RANGE OF 10 kHz TO 60 kHz, WHICH CAN BE COVERTLY DEPLOYED FROM A SUBMARINE PLATFORM. OPTICAL TECHNOLOGIES, INC. (OPTECH), PROPOSES A FIBER-OPTIC EM-FIELD SENSOR TO MEET THIS NEED. THE SENSOR HAS THE FOLLOWING MAJOR FEATURES: ATMOSPHERIC NOISE LIMITED PERFORMANCE; IMMUNITY TO EFFECTS OF ELECTROMAGNETIC PULSE (EMP); IMMUNITY TO ELECTROMAGNETIC INTERFERENCE (EMI) IN THE OPTICAL FIBER LEAD; MULTIMODE LASER OPTICAL SOURCE TO PROVIDE STABLE LASER OPERATION (ELIMINATES MODE HOPPING), AND SINGLE OPTICAL FIBER CONSTRUCTION TO REDUCE THE AMOUNT OF FIBER REQUIRED IN LEAD AND SENSOR ELEMENT.

OPTICAL TECHNOLOGIES INC 360 HERNDON PKWY - STE 1200 HERNDON, VA 22070 DR CHARLES M DAVIS TITLE: MICRO-MINIATURE FIBER-OPTIC ACCELERATION SENSOR FOR IMPROVED SMART MUNITIONS PERFORMANCE T 21 OFFICE: ARDC/SMCAR	ARMY	\$ 49,454
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THE U.S. ARMY IS SEEKING A COMPACT, ECONOMICAL ACCELERATION SENSOR WITH A WIDE OPERATION RANGE FOR INCORPORATING INTO "SMART" PROJECTILE



FISCAL YEAR 1986

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TARGETING SYSTEMS TO IMPROVE SYSTEM PERFORMANCE WITH RESPECT TO DETECTION AND RESOLUTION OF MOTION AND DISTANCES. OPTICAL TECHNOLOGIES, INC. (OPTECH) PROPOSES A UNIQUE FIBER-OPTIC ACCELERATION SENSOR TO MEET THIS NEED. THE PROPOSED SENSOR HAS THE FOLLOWING FEATURES: SMALL SIZE: 0.5 mm DIAMETER AND 5 cm LENGTH; MINIMUM DETECTABLE ACCELERATION AS SMALL AS 10<sup>-2</sup> g; DYNAMIC RANGE OF 100 dB; LOW COST; SMALL CROSS-AXIS SENSITIVITY, AND ELECTROMAGNETIC INTERFERENCE (EMI) AND ELECTROMAGNETIC PULSE (EMP) IMMUNITY.

OPTICAL TECHNOLOGIES INC 360 HERNDON PKWY - STE 1200 HERNDON, VA 22070 CHARLES M DAVIS TITLE: MICRO-MINIATURE FIBER-OPTIC MAGNETIC ANOMALY SENSOR FOR IMPROVED SMART MUNITIONS PERFORMANCE T 23 OFFICE: ARDC/SMCAR	ARMY	\$ 49,767
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THE U.S. ARMY NEEDS A MAGNETOMETER CAPABLE OF DETECTING MAGNETIC ANOMALIES AS SMALL AS 0.1 GAMMA (10<sup>-6</sup> GAUSS) IN THE FREQUENCY RANGE OF <0.1 Hz TO 1.0 kHz. OPTICAL TECHNOLOGIES, INC., PROPOSES A FIBER-OPTIC MAGNETIC SENSOR TO MEET THIS NEED. THE SENSOR HAS THE SIGNIFICANT ADVANTAGE OF ROOM TEMPERATURE OPERATION IN A MICRO-MINIATURE PACKAGE. IT HAS THE FOLLOWING FEATURES: MINIMUM MAGNETIC-FIELD ANOMALIES DETECTION CAPABILITY OF <-0.1 GAMMA; FREQUENCY RANGE FROM <0.1 TO 1.0 kHz; DIPOLE DIRECTIONALITY; PERMANENT MAGNET (PHASE II VERSION) TO PROVIDE BIAS, THUS MINIMIZING POWER REQUIREMENT; SMALL PROBE VOLUME; GROWTH POTENTIAL FOR MULTI-INFLUENCE SENSOR OPERATION; IMMUNITY TO ELECTROMAGNETIC INTERFERENCE (EMI) AND ELECTRO-MAGNETIC PULSES (EMP).

OPTIMA SYSTEMS INC ONE NORTH AVE BURLINGTON, MA 01803 J OTTNEY & R HOFFMAN TITLE: LOW COST OPTICAL NON-CONTACTING RANGING SYSTEM FOR COLLISION AVOIDANCE T 65 OFFICE: NAVSEA	NAVY	\$ 50,000
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ADVANCES IN ROBOTIC TECHNOLOGY HAVE LED TO A NEED OF COLLISION

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>AVOIDANCE SYSTEMS FOR MOBILE ROBOTS. A COLLISION AVOIDANCE SYSTEM USES A MULTITUDE OF NON-CONTACT, SHORT RANGE, DISTANCE MEASUREMENT SENSORS INTERFACED TOGETHER TO COLLECT DISTANCE AND BEARING INFORMATION ABOUT THE ENVIRONMENT OF THE ROBOT. PRESENTLY, NO SUITABLE DISTANCE MEASUREMENT SYSTEMS EXIST FOR THIS APPLICATION. THIS PROPOSAL ADDRESSES THE DEVELOPMENT OF AN INEXPENSIVE, MODULAR, SHORT RANGE, DISTANCE MEASUREMENT SYSTEM FOR MOBILE ROBOTIC APPLICATIONS. THE METHOD OF MEASUREMENT INVOLVES MEASURING THE PHASE DELAY EXPERIENCED BY AN AMPLITUDE MODULATED LIGHT SOURCE AS IT TRAVELS TO AND FROM A TARGET SURFACE. THE PHASE DELAY IS DIRECTLY RELATED TO THE TARGET DISTANCE. THE SYSTEM IS EASILY INTERFACED TO A CENTRAL PROCESSOR AND CONTROLLER.</p>		

OPTIMA SYSTEMS INC ONE NORTH AVE BURLINGTON, MA 01803 DRS I EKCHIAN/J EKCHIAN TITLE: ADAPTIVE FUEL INJECTION TIMING CONTROL FOR REDUCED DIESEL ENGINE NOISE EMISSION T 99	ARMY	\$ 50,000
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OFFICE: BRDC

THE OBJECTIVE OF THE PROPOSED EFFORT IS TO DETERMINE THE FEASIBILITY OF EMPLOYING A REAL-TIME FEEDBACK ENGINE CONTROL SYSTEM FOR SIGNIFICANT REDUCTION OF THE NOISE EMISSION FROM DIESEL ENGINE DRIVEN, ELECTRICAL POWER GENERATION EQUIPMENT. FUEL INJECTION TIMING AND INJECTION RATE HAVE BEEN IDENTIFIED AS PRIME CANDIDATES TO SERVE AS INPUT CONTROL PARAMETERS FOR REDUCING DIESEL COMBUSTION NOISE. IT IS WELL KNOWN IN THE COMBUSTION RESEARCH COMMUNITY THAT COMBUSTION NOISE IN DIRECT INJECTION DIESELS CONSTITUTES A MAJOR, AND SOMETIMES PREDOMINANT, NOISE SOURCE IN OVERALL ENGINE NOISE EMISSIONS, WHICH IS GENERALLY CHARACTERIZED IN THE LITERATURE AS BEING COMPRISED OF TWO COMPONENTS: COMBUSTION NOISE AND MECHANICAL NOISE. HENCE, A SIGNIFICANT REDUCTION IN COMBUSTION NOISE WOULD TRANSLATE INTO A SIGNIFICANT REDUCTION IN OVERALL DIESEL ENGINE NOISE EMISSION. THIS PROVIDES AN ELEGANT AND HIGHLY FLEXIBLE SOLUTION FOR THE DIESEL NOISE REDUCTION PROBLEM, IN MARKED CONTRAST TO THE IMPLEMENTATION OF BULKY BARRIERS, ENCLOSURES OR MAJOR REDESIGN OF THE ENGINE.

OPTIMA SYSTEMS INC ONE NORTH AVE BURLINGTON, MA 01803 DR L EKCHIAN TITLE: A CYLINDER PRESSURE BASED CONTROL ALGORITHM FOR SPARK ASSISTED AND CONVENTIONAL DIESEL ENGINES DEVELOPMENT T 114	ARMY	\$ 49,867
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OFFICE: TACOM/AMSTA

THE ABILITY TO DIAGNOSE AND CONTROL THE COMBUSTION PROCESS IN DIESEL

FISCAL YEAR 1986

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ENGINES IS RECOGNIZED TO BE AN IMPORTANT ADVANTAGE. ENGINE EFFICIENCY, PERFORMANCE, SMOKE EMISSIONS, NOISE, VEHICLE SERVICEABILITY COULD ALL BE IMPACTED FAVORABLY. ENGINE CYLINDER PRESSURE IS MOST SENSITIVE TO COMBUSTION CHARACTERISTICS. MAJOR HURDLES TO THE USE OF CYLINDER PRESSURE FOR CONTROL AND DIAGNOSTICS HAVE BEEN: 1. THE LACK OF SENSORS CAPABLE OF SURVIVING IN THE HRSH ENGINE ENVIRONMENT (OUTSIDE THE R&D APPLICATIONS), AND 2. THE LACK OF EFFECTIVE ACTUATORS SUCH AS ELECTRONICALLY CONTROLLED INJECTORS. MAJOR PROGRESS IS BEING MADE IN BOTH THESE AREAS. IN THIS RESEARCH EFFORT, OPTIMA PROPOSES TO DEVELOP A MICROPROCESSOR BASED ALGORITHM TO USE ENGINE CYLINDER PRESSURE DATA AS A CONTROL PARAMETER TO OPTIMIZE VARIOUS ENGINE FUNCTIONS AND CHARACTERISTICS.

OPTIMETRICS INC 2008 HOGBACK RD - STE 6 ANN ARBOR, MI 48105 WILLIAM O GALLERY TITLE: SCRIBE DATA VALIDATION AND ANALYSIS T 73 OFFICE: AFGL/XOP	AF	\$ 47,244
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THE SCRIBE DATA CONSISTS OF HIGH RESOLUTION (0.06 CM<sup>-1</sup>) MEASUREMENTS OF IR ATMOSPHERIC EMISSION FROM A STRATOSPHERIC BALLOON PLATFORM. THIS PROPOSAL HAS THREE OBJECTIVES: 1. TO VALIDATE THE SCRIBE SPECTRA WITH REGARD TO ABSOLUTE RADIOMETRIC CALIBRATION, SPECTRAL RESOLUTION, AND FREQUENCY CALIBRATION; 2. TO VALIDATE MODELS FOR PREDICTING ATMOSPHERIC RADIANCE USING THE SCRIBE SPECTRA; AND 3. USE THE VALIDATED SPECTRA AND MODELS TO DETECT THE PRESENCE AND DETERMINE THE ABUNDANCE OF TRACE GASES IN THE STRATOSPHERE.

OPTRA INC 83 PINE ST - WEST PEABODY OFFICE PK PEABODY, MA 01960 DR MICHAEL HERCHER TITLE: NON-CONTACT LASER MEASUREMENT OF THERMAL EXPANSION T 115 OFFICE: NSWC	NAVY	\$ 49,966
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OPTRA PROPOSES A NON-CONTACT TECHNIQUE FOR THE MEASUREMENT OF THERMAL EXPANSION. THE TECHNIQUE IS OPTICAL AND IS BASED ON THE USE OF A

FISCAL YEAR 1986

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2-FREQUENCY HeNe LASER. NO SPECIAL PREPARATION OF THE TEST PART IS REQUIRED, AND THE MEASUREMENT CAN BE MADE THROUGH THE WINDOW OF A VACUUM CHAMBER. THE THEORETICAL BASIS FOR THE MEASUREMENT IS FULLY DESCRIBED, AND PRELIMINARY EXPERIMENTAL RESULTS--DEMONSTRATING THE FEASIBILITY OF ACCURATE NON-CONTACT MEASUREMENTS OF LATERAL DIS-PLACEMENT, USING MACHINED AND GROUND SURFACES--ARE CITED.

OPTRA INC 83 PINE ST - W PEABODY OFFICE PK PEABODY, MA 01960 GEERT WYNTJES TITLE: LASER SENSOR FOR A MEASUREMENT OF SHEAR WAVES T 156 OFFICE: NAVSEA/NUSC	NAVY	\$ 49,727
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THIS PROPOSAL ADDRESSES THE DIRECT MEASUREMENT OF FREE SURFACE MECHANICAL SHEAR WAVES WITH A NON-CONTACT LASER SENSOR. THE PROPOSED SENSOR UTILIZES A HETERODYNE, 2-FREQUENCY HeNe LASER DEVELOPED BY OPTRA. A PROTOTYPE HAS BEEN TESTED AND HAS THE CAPABILITY OF MEASURING IN-PLANE VIBRATIONS WITH SENSITIVITIES EQUAL TO OR EXCEEDING THOSE OF THE BEST CONTACT VIBRATION SENSORS, WITH THE ADDED BENEFIT OF A FREQUENCY RESPONSE COVERING THE FULL RANGE FROM DC TO 50KHz. IN ADDITION, THE SENSOR HAS THE INHERENT ADVANTAGE OF A HIGH DEGREE OF ORTHOGONALITY WHICH ENABLES THE REJECTION OF OUT-OF-PLANE VIBRATIONS WHICH MAY BE PRESENT SIMULTANEOUSLY ON THE SURFACE BEING MEASURED OR IMPOSED ON THE SENSOR ITSELF. THE SENSOR IS COMPACT AND CAN BE MADE WHOLLY PASSIVE AND REMOTE BY USING FIBER OPTICS. THE AIM OF THE PROPOSED RESEARCH IS TO DEVELOP AN OPTIMIZED SENSOR AND TO DEMONSTRATE ITS PERFORMANCE ON A SIMPLE STRUCTURE EXCITED TO HAVE SHEAR WAVES, WHILE AT THE SAME TIME THE SENSOR AND STRUCTURE ARE SUBJECTED TO OTHER VIBRATIONS.

OPTRA, INC. 83 PINE STREET PEABODY, MA 01960 GEERT WYNTJES TITLE: INTERFEROMETRIC OPTICAL SYNCHRO FOR ALIGNMENT TRANSFER T 3 OFFICE:	SDIO	\$ 49,191
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SPACE WEAPONS FIRE CONTROL REQUIRES THAT THE FINAL WEAPON AIM POINT

FISCAL YEAR 1986

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AMOUNT

BE PREDICTED WITH A PRECISION IN THE TENS OF NANORADIANS RANGE. THIS REQUIRES THAT THE ANGULAR COORDINATES OF THE TRACKING OR DESIGNATING SEEKER BE MEASURED, TRANSMITTED AND REPEATED WITH SIMILAR PRECISION. CLASSIC APPROACHES FOR MAKING HIGH ANGULAR RESOLUTION MEASUREMENTS INCLUDE MAGNETIC SYNCHROS (RESOLVERS) AND OPTICAL SHAFT ENCODERS. THESE FALL SHORT IN TERMS OF THE REQUIRED PRECISION BY A SUBSTANTIAL MARGIN, AND IN ADDITION, IN THE CASE OF THE SHAFT ENCODERS, THEY BECOME UNWIELDY AT THE HIGH PRECISION LEVELS. OPTRA PROPOSES TO DEMONSTRATE A ROTATION MEASUREMENT TECHNOLOGY OF GREATLY IMPROVED PRECISION AND RESOLUTION. THE TECHNOLOGY IS BASED ON THE USE OF A 2-FREQUENCY HeNe, HETERODYNE LASER AND REMOTE INTERFEROMETERS LINKED BY MONOMODE POLARIZATION HOLDING FIBERS. IN ADDITION TO ITS HIGH RESOLUTION THE MEASUREMENT IS UNAMBIGUOUS WITH DIRECTION, AND ANGULAR RATES CAN BE LARGE. THE SENSOR PART IS COMPACT AND WHOLLY PASSIVE, THEREFORE IT IS UNABLE TO GENERATE EMI OR BE AFFECTED BY IT, AN IMPORTANT CONSIDERATION WHERE WEAPON FIRINGS TAKE PLACE OF WHERE HIGH MAGNETIC FIELDS DUE TO HIGH CURRENT TORQUERS ARE PRESENT.

OPTRON SYSTEMS INC

DARPA

\$ 49,980

PO BOX 98

NEWTON HIGHLANDS, MA 02161

ROBERT F DILLON

TITLE:

HIGH-EFFICIENCY LOW-COST UV LASER BEAM WRITER FOR LITHOGRAPHIC  
PATTERN GENERATION

T 19

OFFICE: DARPA

THE DEVELOPMENT OF A LOW COST LASER BEAM WRITER THAT COULD GENERATE LITHOGRAPHIC PATTERNS AT HIGH SPEED WOULD BE OF SIGNIFICANT BENEFIT IN THE DEVELOPMENT OF HIGH-QUALITY, HIGH EFFICIENCY, BINARY OPTICAL COMPONENTS AND SUBSYSTEMS. IT IS PROPOSED TO INVESTIGATE A NEW CONCEPT FOR A HIGH EFFICIENCY IMAGING PROTOTYPE LASER BEAM WRITER AND DEVELOP A LABORATORY PROTOTYPE TO DEMONSTRATE ITS FEASIBILITY. THE HEART OF THE PROPOSED LASER BEAM WRITER IS A HIGH-RESOLUTION, HIGH-OPTICAL-EFFICIENCY HYBRID SPATIAL LIGHT MODULATOR CALLED THE ELECTROSTATIC PRECIPITATING LIGHT MODULATOR (EPLM) THAT CAN BE ELECTRONICALLY OR OPTICALLY PROGRAMMED WITH MASK PATTERNS. BY READING OUT THE DEVICE WITH EXPANDED AND COLLIMATED UV LASER RADIATION, AN IMAGE OF THE DESIRED MASK PATTERN CAN BE PROJECTED ONTO THE SURFACE OF THE MATERIAL TO BE PROCESSED. THE PROPOSED FINAL VERSION OF THE LASER BEAM WRITER WILL EMPLOY A MODULATOR WITH AN ACTIVE AREA (SQUARE) OF

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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100mm X 100mm, A SPATIAL RESOLUTION OF ABOUT 33 LINES/mm, AND A FULL-FRAME WRITE TIME OF ABOUT ONE SECOND. THUS BY DEMAGNIFYING THE MODULATOR IMAGE WITH HIGH QUALITY IMAGING OPTICS, MASKS WITH SPATIAL RESOLUTION IN EXCESS OF 200 LINES/mm CAN BE PRODUCED QUICKLY AND EFFICIENTLY. THE SYSTEM IS ALSO CAPABLE OF MODIFYING AND COPYING EXISTING LITHOGRAPHIC MASKS BY IMAGING THSES MASKS ONTO THE OPTICAL THE OPTICAL INPUT PORT OF THE SPATIAL LIGHT MODULATOR.

OPTRON SYSTEMS, INC. P.O. BOX 98 NEWTON HIGHLANDS, MA 02161 ROBERT F. DILLON TITLE: HYBRID SPATIAL LIGHT MODULATOR FOR JOINT PROCESSING OF RADAR AND OPTICAL IMAGES	SDIO	\$ 49,937
T 3 OFFICE:		

THE PROBLEM OF DISCRIMINATING BETWEEN TARGETS AND DECOYS IN A SDI OR BMD SCENARIO WILL MOST LIKELY REQUIRE THE USE OF IMAGING SYSTEMS OPERATING AT TWO OR MORE VASTLY DIFFERENT WAVELENGTHS (E.G. MICROWAVE AND OPTICAL). REAL-TIME OPTICAL PROCESSORS THAT COULD, FOR EXAMPLE, EMPLOY IMAGE UNDERSTANDING TECHNIQUES AND THEREBY EXTRACT AND COMBINE THE SALIENT FEATURES OF, SAY, RANGE-DOPPLER RADAR IMAGES AND HIGHLY-CLUTTERED OR DEGRADED OPTICAL IMAGES FOR TARGET IDENTIFICATION COULD PROVE MOST USEFUL. IT IS PROPOSED TO INVESTIGATE IN THIS PHASE I STUDY, (a) THE FEASIBILITY OF A SPATIAL LIHT MODULATOR THAT COULD BE USED TO MIX TWO SUCH IMAGES, AND (b) COMPATIBLE ALGORITHMS (BASED ON OPTICAL ASSOCIATIVE MEMORY AND IMAGE UNDERSTANDING TECHNIQUES) FOR FEATURE EXTRACTION, IMAGE IDENTIFICATION, AND CLUTTER REJECTION. THE VERSATILITY OF THE PROPOSED SPATIAL LIGHT MODULATOR ALSO MAKES IT USEFUL FOR COMBINING GENERAL ELECTRONIC AND OPTICAL SIGNALS, AND AS EITHER AN ELECTRONIC-TO-OPTICAL OR OPTICAL-TO-OPTICAL TRANSDUCER. IT COULD, THEREFORE, BE USED IN GENERAL PURPOSE OPTICAL PROCESSORS FOR OTHER SDI SURVEILLANCE, ACQUISITION AND DISCRIMINATION TASKS.

OPTRON SYSTEMS, INC. P.O. BOX 98 NEWTON HIGHLANDS, MA 02161 ROBERT F. DILLON TITLE: HIGH RESOLUTION HIGH SPEED BISTABLE OPTICAL DEVICE FOR OPTICAL COMPUTING APPLICATIONS	SDIO	\$ 49,935
T 9 OFFICE:		

OPTICAL COMPUTERS ARE RECOGNIZED AS POTENTIALLY USEFUL ELEMENTS IN

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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THE QUEST TO MEET THE INTENSE BATTLE MANAGEMENT COMPUTATIONAL REQUIREMENTS OF THE SDI PROGRAM. CURRENTLY, OPTICAL COMPUTERS ARE GREATLY LIMITED IN PERFORMANCE BECAUSE NO EXISTING NONLINEAR LIGHT MODULATION DEVICE SIMULTANEOUSLY OFFERS FAST OPTICAL SWITCHING WITH HIGH GAMMA (THRESHOLD), HIGH SPATIAL BANDWIDTH, LOW POWER DISSIPATION, OPTICAL GAIN, AND HIGH RELIABILITY. A NONLINEAR SPATIAL LIGHT MODULATION DEVICE IS PROPOSED WHICH OFFERS ALL THESE FEATURES AND, IN PRINCIPLE, CAN BE EFFICIENTLY MASS-PRODUCED AT LOW COST. THESE DEVICES ACHIEVE OPTICAL GAIN AND, CONSEQUENTLY, CAN BE CASCADED TO REALIZE MANY COMPLEX OPTICAL COMPUTING ARCHITECTURES. THE PROPOSED PHASE I PROGRAM PLAN INCLUDES THE FOLLOWING TASKS: a) DEVICE PERFORMANCE ANALYSIS, b) PROTOTYPE DEVICE DESIGN, c) SMALL-SCALE PROTOTYPE DEVICE FABRICATION, d) DESIGN OPTIMIZATION, AND e) DEVICE PERFORMANCE TESTING.

ORD INC PO BOX 50 NAHANT, MA 01908 DAVID A ECKERSON TITLE: FIBER OPTIC MICROSENSOR FOR RECEPTOR-BASED ASSAYS T 38 OFFICE: CRDC/AMSMC	ARMY	\$ 49,993
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OUR OBJECTIVE IS TO DETERMINE THE FEASIBILITY OF APPLYING OUR FIBER OPTIC MICROSENSOR TO RECEPTOR-BASED ASSAY IN THE FIELD. OUR MICROSENSOR SENSES ONLY WITHIN THE SUB WAVELENGTH THIN EVANESCENT ZONE ON THE WALL OF AN OPTICAL FIBER. IT IS BEING APPLIED TO FLUOROIMMUNOASSAY FOR BOTH MILITARY AND COMMERCIAL APPLICATIONS. THE ASSOCIATED INSTRUMENT HAS THE POTENTIAL OF BEING MINIATURIZED (POCKET SIZE), MODULAR, BATTERY OPERATED, AND USED FOR BOTH IMMUNOASSAYS AND RECEPTOR-BASED ASSAYS. THE WAVELENGTH USED WILL BE LONG, TO BETTER ACCOMMODATE THE LARGE MOLECULAR STRUCTURE OF RECEPTOR-BASED ASSAY. THE EFFORT WILL INCLUDE AN OPTIMIZATION ANALYSIS AND THE CONSTRUCTION OF A BREADBOARD AS DEFINED BY THE ANALYSIS. TO THE BEST OF OUR KNOWLEDGE, THIS BREADBOARD WILL BE THE FIRST FLUORIMETER EVER TO USE AN LED AS THE LIGHT SOURCE. THE BREADBOARD PERFORMANCE WILL BE EVALUATED WITH RESPECT TO THE FIELD REQUIREMENTS. WE WILL ANALYZE THE FEASIBILITY OF A FIELD UNIT FOR RECEPTOR-BASE ASSAY.

P.P.L. (COMPOSITE SYSTEMS DIV) 501 PLAINSBORO RD PLAINSBORO, NJ 08536 DR DONALD E HUDGIN TITLE: NOVEL HIGH TEMPERATURE METAL-PLASTICS COMPOSITES FOR SEALING MATERIALS T 168 OFFICE: AFWAL/ML	AF	\$ 48,461
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ADVANCED TECHNOLOGY IS NEEDED TO BROADEN THE TEMPERATURE RANGE OF

FISCAL YEAR 1986

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ENGINEERING PLASTICS FOR CHEMICAL, THERMAL AND FLUID AGING STABILITY OF SEALING MATERIALS OF THE 0 DEG C. TO 400 DEG C. TEMPERATURE RANGE. CONVENTIONAL MATERIALS USED FOR THIS PURPOSE SUFFER FROM ONE OR MORE OF THE FOLLOWING LIMITATIONS: THEY DO NOT HAVE ADEQUATE THERMAL STABILITY; THEY ARE NOT EASILY PROCESSABLE AND LACK THE REQUIRED BONDING CHARACTERISTICS. THE PROPOSED PROGRAM HAS AS IT OBJECTIVE PROOF OF FEASIBILITY OF A NOVEL TECHNIQUE FOR PREPARING HIGH TEMPERATURE PLASTICS BLENDED WITH METALS. THE METAL-PLASTIC COMBINATION ALLOWS HEAT TO DISSIPATE MORE READILY AND FACILITATES EASY AND IMPROVED PROCESSABILITY FOR SEALING PURPOSES. IN THE METAL-PLASTIC BLENDING PROCESS, THERE ARE PRODUCED NEWLY EXPOSED VIRGIN METAL SURFACES WHICH BOND INTIMATELY TO THE MOLTEN PLASTICS, RESULTING IN A HIGHLY REINFORCED STRUCTURE. SUCH A STRUCTURE, BASED ON HIGH TEMPERATURE LIQUID CRYSTAL POLYMERS, IS A CANDIDATE FOR USE IN ADVANCED GAS TURBINES, ENGINES FUEL CONTROLS AND HYDRAULIC SEALING SYSTEMS.

PACER SYSTEMS INC  
300 WELSH RD - 4 HORSHAM BUSINESS CTR  
HORSHAM, PA 19044

AF

\$ 40,483

JOAN M RYDER

TITLE:

MODERN TRAINING MODEL CONCEPTS

T 284

OFFICE: AMD/RDO

CURRENT APPROACHES TO TRAINING DEVELOPMENT FOCUS PRIMARILY ON OBSERVABLE BEHAVIORS AND LARGELY IGNORE THE MEDIATIONAL PROCESSES THAT ARE NOW THOUGHT TO UNDERLIE LEARNING. WE PROPOSE TO DEVELOP AN INTEGRATED CONCEPTUAL FRAMEWORK OF SKILL ACQUISITION USING AN INFORMATION PROCESSING/COGNITIVE SCIENCE APPROACH, AND TO APPLY THAT FRAMEWORK TO THE DEVELOPMENT OF TRAINING TECHNOLOGY, PARTICULARLY LOW COST DEVICES. BASED ON A REVIEW OF THE LITERATURE ON COGNITIVE AND MOTOR SKILL ACQUISITION AND ON SUCCESSFUL LOW COST TRAINERS, WE WILL DEVELOP A MODEL OF THE SKILL ACQUISITION PROCESS INCLUDING A DEFINITION OF THE BASIC ELEMENTS OF SKILLED PERFORMANCE AND AN EXPLANATION OF THE COGNITIVE REPRESENTATION OF SKILLS. WE WILL MAKE SPECIFIC RECOMMENDATIONS FOR CHANGES TO THE INSTRUCTIONAL SYSTEM DESIGN (ISD) PROCESS TO INCORPORATE COGNITIVE APPROACHES TO TRAINING DEVELOPMENT AND TO PROVIDE A FOUNDATION FOR DETERMINING THE APPROPRIATE TASK/SKILL COMPONENTS TO BE TRAINED WITH LOW COST DEVICES.



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
PACER SYSTEMS INC 300 WELSH RD - 4 HORSHAM BUSINESS CTR HORSHAM, PA 19044 DAVID R DAUGHERTY TITLE: UPDATE IV/P-3C EMBEDDED TRAINING STUDY T 170 OFFICE: NAVAIR/NTEC	NAVY	\$ 41,321

PACER SYSTEMS, INC. (PACER) PROPOSES A PHASE I STUDY TO DETERMINE AN APPROACH FOR INTEGRATING EMBEDDED TRAINING WITH THE FUTURE UPDATE IV AVIONICS SYSTEM AND INVESTIGATING THE FEASIBILITY OF RETROFITTING A SELECTED PORTION OF THAT EMBEDDED TRAINING INTO THE EXISTING-P-3C UPDATE III. THE STUDY WILL INCLUDE A PARTIAL HARDMAN ANALYSIS, DEVELOPMENT OF ALTERNATIVE APPROACHES, TRADE-OFF STUDIES, PREFERRED APPROACH DETAIL, AND PREPARATION OF A PHASE I STUDY REPORT AND PHASE II DEVELOPMENT PLAN. PACER WILL TAKE ADVANTAGE OF ITS IN-HOUSE OPERATIONAL AND TECHNICAL EXPERIENCE WITH THE P-3C, CURRENT UNDERSTANDING OF UPDATE IV REQUIREMENTS, TRAINER DESIGN AND DEVELOPMENT EXPERIENCE AND HARDMAN ANALYSIS EXPERIENCE TO PROVIDE AN EMBEDDED TRAINING APPROACH THAT RESPONDS TO THE VERY REAL TRAINING PROBLEMS OF DEPLOYED VP SQUADRONS. THE TRAINING NEEDS OF ALL OPERATORS (TACCO, NAV/COMM, AND SENSOR STATIONS 1, 2 AND 3) WILL BE ADDRESSED INDIVIDUALLY AND AS A TEAM.

PACER SYSTEMS INC 300 WELSH RD - 4 HORSHAM BUSINESS CTR HORSHAM, PA 19044 RALPH D FIFE TITLE: TARGET ACQUISITION TRAINER FOR STRIKE AIRCREW T 168 OFFICE: NAVAIR/NTEC	NAVY	\$ 45,485
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PACER SYSTEMS, INC (PACER) PROPOSES A PHASE I STUDY TO DETERMINE THE FEASIBILITY OF DEVELOPING A COST-EFFECTIVE, DEDICATED TRAINER THAT ADDRESSES VISUAL TARGET ACQUISITION PROBLEM BY PROVIDING AN ADEQUATE SIMULATION OF TARGET, MISSION PROFILE AND ENVIRONMENTAL FACTORS. THE STUDY WILL TAKE INTO ACCOUNT MAJOR AREAS OF CONSIDERATION INCLUDING TARGET TYPE (STRATEGIC/TACTICAL), AIRCRAFT INGRESS/EGRESS (ALTITUDE, AIR SPEED), AND ENVIRONMENTAL FACTORS (WEATHER CONDITIONS, SMOKE, TARGET MASKING, FOLIAGE, FRIENDLY FORCES). FOUR TASKS ARE PROPOSED--I- INVESTIGATE EXISTING TARGET ACQUISITION MODELS, II-FORMULATE A GENER-

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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LIZED VISUAL TARGET ACQUISITION MASK MODEL, III- PROVIDE A DESCRIPTION OF TASK TRAINING ENVIRONMENT; AND IV-PROVIDE RECOMMENDATIONS FOR PHASE II (PROPOSED SYSTEM DESCRIPTION AND RECOMMENDED EVALUATION PROCEDURES). THE RECOMMENDED PHASE II SYSTEM DESCRIPTION WILL ADDRESS VISUAL SYSTEM REQUIREMENTS TO REPRESENT THE TARGET ENVIRONMENT, COMPUTER RESOURCE REQUIREMENTS, AND THE SIMULATED COCKPIT ENVIRONMENT IN ADDITION TO HARDWARE, SOFTWARE AND DATA BASE RECOMMENDATIONS.

PACIFIC APPLIED RESEARCH 6 CRESTWIND DR. RANCHO PALOS VERD, CA 90274 WALTER R. WARREN, JR. TITLE: SHORT WAVELENGTH CHEMICAL LASER FLUID DYNAMICS T 1 OFFICE:	SDIO	\$ 55,327
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FLUID DYNAMICS HAS PLAYED MAJOR ROLES IN THE DEVELOPMENT OF ALL HIGH POWER CHEMICAL LASERS; E.G., EFFICIENT HF/DF CW CHEMICAL LASERS WOULD NOT BE FEASIBLE WITHOUT THE COUPLING OF SUPERSONIC EXPANSION, FAST DIFFUSION, AND HEAT RELEASE COMPENSATION TECHNIQUES WITH LASER CHEMISTRY PROCESSES. BECAUSE OF THE GENERAL ENERGETIC SIMILARITIES BETWEEN VIBRATIONAL TRANSITION AND ELECTRONIC TRANSITION CHEMICAL LASER MECHANISMS, WE CAN EXPECT THAT THE USE OF FLUID DYNAMICS CONCEPTS WILL BE EQUALLY IMPORTANT IN THE DEMONSTRATION AND DEVELOPMENT OF THE LATTER AS EFFICIENT, SCALABLE, SHORT WAVELENGTH CHEMICAL LASERS, SWCLS. WE BELIEVE THAT PAST SWCL STUDIES HAVE NOT GIVEN SUFFICIENT ATTENTION TO FLUID DYNAMICS IN DETERMINING THE FEASIBILITY OF PROPOSED LASER MECHANISMS. THEREFORE, A PROGRAM IS PROPOSED WITH THE GOAL OF COUPLING IMPORTANT FLUID DYNAMIC MECHANISMS WITH PROMISING CHEMICAL MECHANISMS TO PRODUCE LASER CONFIGURATIONS WITH OPTIMUM HIGH POWER LASER POTENTIAL. PHASE I IS A 6 MONTH ANALYTICAL STUDY WITH THREE OBJECTIVES: DEVELOPMENT OF GENERALIZED FLUID DYNAMICS MODELS AND ANALYTICAL PROCEDURES, SYNTHESIS OF OPTIMUM LASER CONFIGURATIONS (FOR LABORATORY DEMONSTRATION AND SCALABILITY STUDIES AND FOR SYSTEM IMPLEMENTATION) FOR THREE POTENTIAL SWCL MECHANISMS, AND DETAILED DESIGN OF LABORATORY EXPERIMENTS TO BE CONDUCTED IN PHASE II.

PAGE AUTOMATED TELECOMMUNICATIONS SYS STAR ROUTE 2 - BOX 188 /8000 ALPINE RD LA HONDA, CA 94020 SABIN HEAD TITLE: ENTITY RELATION DIAGRAMS FOR DESIGN AUTOMATION T 114 OFFICE: AFWAL/AA	AF	\$ 50,000
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THE FOCUS OF THIS PROPOSAL IS THE DEVELOPMENT OF ENTITY-RELATION

FISCAL YEAR 1986

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(ER) MODELS FOR THE VERTICAL INTEGRATION OF THE DESIGN OF LARGE-SCALE DIGITAL ELECTRONICS SYSTEMS. THIS ADDRESSES THE MOST SERIOUS PROBLEM IN THE DEVELOPMENT OF NEW ELECTRONICS PRODUCTS: THE DESIGN BOTTLENECK. THE PROJECT WILL RESULT IN A COLLECTION OF DESIGN VIEWPOINTS AND MODELS FOR EACH INTEGRATED INTO A SINGLE OVERALL CONCEPTUAL SCHEMA. SEVERAL TECHNICAL PROBLEMS WILL BE DEALT WITH ALONG THE WAY, INCLUDING EXTENSIONS TO THE INITIAL ER MODELLING FORMALISM ITSELF AND ATTEMPTS TO OVERCOME HISTORIAL FORCES THAT HAVE LIMITED THE RECEPTIVITY OF HIGH-LEVEL DA TOOLS IN THIS INDUSTRIAL DESIGN AUTOMATION COMMUNITY.

PALOMAR CORP 1715 N ST NW WASHINGTON, DC 20036 CARL B FELDBAUM TITLE: IMPLEMENTING DOD INSTRUCTION 4245.4 REGARDING NUCLEAR SURVIVABILITY AND HARDNESS REQUIREMENTS: A PROGRAM MANAGERS MANUAL T 5 OFFICE: AM/SBIR	DNA	\$ 50,247
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THIS PROJECT WILL DEVELOP A MANUAL FOR PROGRAM MANAGERS TO IMPROVE IMPLEMENTATION OF DOD INSTRUCTION 4245.4, "ACQUISITION OF NUCLEAR SURVIVABLE SYSTEMS." THIS INSTRUCTION PROVIDES GENERAL MANAGEMENT AND DOCUMENTATION GUIDANCE FOR NUCLEAR SURVIVABILITY AND HARDNESS ACTIVITIES. THE MANUAL WILL PROVIDE PROGRAM MANAGERS WITH INFORMATION ON THE PROGRAMMATIC ASPECTS OF DOD 4245.4, MAKING REFERENCE TO SOURCES WHERE ADDITIONAL TECHNICAL INFORMATION CAN BE OBTAINED. SEVERAL EXISTING FACTORS ADVERSELY EFFECT THE COMPREHENSIVE IMPLEMENTATION OF THE NUCLEAR SURVIVABILITY REQUIREMENTS, INCLUDING A LACK OF DETAILED KNOWLEDGE BY PROGRAM MANAGERS OF NUCLEAR WEAPONS EFFECTS, AND THE UNAVAILABILITY OF SURVIVABILITY AND HARDNESS GUIDANCE IN ONE COMPREHENSIVE DOCUMENT.

PARTNERSHIPS LTD PO BOX 6503 LAWRENCEVILLE, NJ 08648 DR PAUL H KYDD TITLE: ADVANCED AIRCRAFT FUEL EVALUATION T 183 OFFICE: AFWAL/PO	AF	\$ 49,950
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THE OVERALL OBJECTIVE OF THE PHASE I EFFORT WILL BE TO PROVIDE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>ESTIMATES OF THE AVAILABILITY, COST AND QUALITY OF NAPHTHENIC HYDRO-CARBON FUELS FOR ADVANCED HYPERSONIC VEHICLE PROPULSION AS A FUNCTION OF TIME. A PRELIMINARY SPECIFICATION FOR AN OPTIMISED NAPHTHENIC FUEL WILL BE AGREED UPON. POTENTIAL FEED STOCKS AND PROCESSING ROUTES TO PROVIDE THE FUEL WILL BE SURVEYED AND SELECTED. SMALL SAMPLES WILL BE PREPARED DEMONSTRATING THE TECHNOLOGY SELECTED AND PROVIDING ANALYTICAL RESULTS. THE AVAILABILITY AND COST OF THE FUEL WILL BE PROJECTED THROUGH THE END OF THE CENTURY.</p>		

PDA ENGINEERING 1560 BROOKHOLLOW DR. SANTA ANA, CA 92705 JOSEF E. WUERER, PHD TITLE: SHORT WAVELENGTH LASER/MATERIAL INTERACTION EFFECTS ANALYSIS AND SIMULATION T 8 OFFICE:	SDIO	\$ 83,538
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THE DEPARTMENT OF DEFENSE IS ALLOCATING SIGNIFICANT RESOURCES TO EXPLORE DEVELOPMENT OF NOVEL SHORT WAVELENGTH LASER (SWL) CONCEPTS INTO WEAPON GRADE SYSTEMS. THE DESIGN GOALS FOR THESE WEAPONS HAVE BEEN ESTABLISHED LARGELY ON THE BASIS OF LETHALITY DATA OBTAINED WITH IR LASERS. IN THE PROPOSED PROGRAM, THE POTENTIAL OF HARDENING RESPONSIVE TARGETS WITH CONCEPTS TAILORED SPECIFICALLY TO COUNTER SHORT WAVELENGTH LASERS WILL BE EXPLORED ANALYTICALLY. OPTICS FOR AN SWL SIMULATION FACILITY WILL BE DEVELOPED. THE EXPERIMENTAL EFFORT REQUIRED FOR AN EARLY VALIDATION OF SWL/MATERIALS INTERACTION EXPERIMENTAL RESULTS ALSO WILL BE ASSESSED.

PDA ENGINEERING 1560 BROOKHOLLOW DR. SANTA ANA, CA 92705 MATTHEW M. SHERMAN TITLE: ENDOATMOSPHERIC PROJECTILES FOR KINETIC ENERGY WEAPONS - A FEASIBILITY STUDY T 2 OFFICE:	SDIO	\$ 69,054
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STUDIES WILL BE PERFORMED TO DETERMINE THE FEASIBILITY OF USING HIGH PERFORMANCE ELECTROMAGNETICALLY LAUNCHED PROJECTILES AS PART OF A

FISCAL YEAR 1986

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KINETIC ENERGY WEAPON SYSTEM FOR BALLISTIC MISSILE TERMINAL DEFENSE. THE STUDY WILL DETERMINE OPERATIONAL PERFORMANCE LIMITS IMPOSED BY THE USE OF PASSIVE THERMAL PROTECTION MATERIALS AND BY THE USE OF UNGUIDED PROJECTILES. THE EFFECTS OF LAUNCHER RELEASE CHARACTERISTICS ON PROJECTILE ACCURACY WILL BE EVALUATED, AND A PROJECTILE DESIGN WILL BE DEFINED TO ACCOMPLISH A SPECIFIED BASELINE INTERCEPT MISSION.		

PDA ENGINEERING 1560 BROOKHOLLOW DR SANTA ANA, CA 92705 T E MACK TITLE: TECHNOLOGY PROGRAM ON JOINING METHODS FOR HIGH TEMPERATURE CARBON-CARBON COMPOSITE STRUCTURAL COMPONENTS T 124 OFFICE: AFWAL/FI	AF	\$ 47,945
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SEVERAL GOVERNMENT ADVANCED TECHNOLOGY PROGRAMS (TAV, BVG, ELITE, ETC.) HAVE PROPOSED SYSTEMS WHICH REQUIRE "HOT" STRUCTURES, CAPABLE OF SUSTAINING OPERATIONAL LOADS AT EXPOSURE TEMPERATURES OF 2500 DEG F AND HIGHER. THE MOST PROMISING MATERIAL CANDIDATE FOR THESE HOT STRUCTURE APPLICATIONS IS COMPOSITE CARBON-CARBON. THE SUCCESSFUL APPLICATION OF CARBON-CARBON COMPOSITES TO THE SOLUTION OF HIGH TEMPERATURE STRUCTURE PROBLEMS HAS BEEN WELL DEMONSTRATED BY EXAMPLES SUCH AS SPACE SHUTTLE, ROCKET NOZZLE EXIT CONES, JET ENGINE AFTER BURNER SECTIONS, AND GAS TURBINE ENGINE ROTORS. SIMILARLY, ADVANCED HYPERSONIC MISSILE AIRFRAME STRUCTURES ARE EXPECTED TO CONSIST OF COMPLEX STRUCTURAL ASSEMBLIES JOINED TOGETHER TO FORM A SINGLE UNIT CAPABLE OF SUPPORTING THE VARIOUS FUNCTIONAL SUBSYSTEMS AND PAYLOAD. CONVENTIONAL JOINING AND ATTACHMENT METHODS (METAL FASTENERS, ADHESIVES, ETC.) CANNOT BE USED AT THESE EXTREME TEMPERATURES. PDA ENGINEERING PROPOSES TO DEFINE AND ANALYTICALLY ASSES FEASIBLE COMPOSITE CARBON-CARBON STRUCTURAL JOINING METHODS FOR TYPICAL MISSILE AIRFRAME STRUCTURES. PDA WILL USE ITS EXTENSIVE CARBON-CARBON COMPOSITE DESIGN EXPERIENCE AND MATERIAL DATA BASE AND ITS THREE DIMENSIONAL (3D) ANISOTROPIC COMPOSITE ANALYSIS CAPABILITIES TO DEFINE AND ASSESS CANDIDATE JOINING METHODS. A DETAILED PHASE II TEST PLAN (LOW AND HIGH TEMPERATURE TESTING) WILL BE DEFINED TO VALIDATE THE PHASE I DESIGN CONCEPTS.

PDA ENGINEERING 1560 BROOKHOLLOW DR SANTA ANA, CA 92705 T E MACK TITLE: THE OXIDATION PROTECTION AND MATRIX PROPERTIES OF CARBON-CARBON COMPOSITES TECHNOLOGY PROGRAM T 156 OFFICE: AFWAL/ML	AF	\$ 48,197
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SEVERAL GOVERNMENT ADVANCED TECHNOLOGY PROGRAMS (ELITE, TAV, BGV),

FISCAL YEAR 1986

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ETC.) ARE PROPOSING SYSTEMS WHICH REQUIRE STRUCTURAL COMPONENTS CAPABLE OF SUSTAINING OPERATIONAL LOADS AT EXPOSURE TEMPERATURES OF 3000 DEG F AND HIGHER. THE MOST PROMISING MATERIAL SOLUTION FOR THESE HOT STRUCTURE APPLICATIONS IS COMPOSITE CARBON-CARBON. THE SUCCESSFUL APPLICATION OF THIS CLASS OF MATERIALS HAS BEEN WELL DEMONSTRATED BY EXAMPLES SUCH AS SPACE SHUTTLE, ROCKET NOZZLE THROATS AND EXIT CNES, JET ENGINE AFTERBURNER SECTIONS AND GAS TURBINE ENGINE COMPONENTS. HOWEVER, TWO MAJOR MATERIAL DEFICIENCIES EXIST; LOW MATRIX MECHANICAL PROPERTIES (INTERLAMINAR SHEAR AND CROSS-PLY TENSILE STRENGTHS AND STIFFNESSES) AND COATING COMPATIBILITY (OXIDATION PROTECTION). PDA ENGINEERING PROPOSES A NEW MATERIAL DEVELOPMENT AND EVALUATION PROGRAM THAT WILL ATTEMPT TO TOUGHEN THE COATING AGAINST THERMAL CYCLE CRACK PROPAGATION WHILE SIMULTANEOUSLY IMPROVING THE SUBSTRATE MATRIX PROPERTIES.

PDA ENGINEERING 1560 BROOKHOLLOW DR SANTA ANA, CA 92705 WILLIAM H PFEIFER TITLE: ASSESSMENT OF COMPUTED TOMOGRAPHY AS AN IMPROVED QUANTITATIVE NON-DESTRUCTIVE EVALUATION TECHNIQUE FOR COMPOSITE MATERIALS T 159 OFFICE: AFWAL/ML	AF	\$ 47,255
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A METHOD OF DEMONSTRATING COMPUTER TOMOGRAPHY (CT) AS A QUANTITATIVE NONDESTRUCTIVE EVALUATION TOOL FOR LOW TEMPERATURE COMPOSITES IN PROPOSED. THE FEASIBILITY OF CT APPLIED TO FLAT LAMINATE PLATE AND FILAMENT WOUND CYLINDRICAL SPECIMENS FABRICATED FROM GLASS FIBER/EPOXY AND GRAPHITE FIBER/EPOXY WILL BE INVESTIGATED. THE SPECIFIC DIFFERENCES BETWEEN INDUSTRIAL AND MEDICAL SCANNERS WILL BE EXPLORED, AS WILL THE SENSITIVITIES OF CT DATA TO MATERIAL DENSITIES AND GEOMETRIES. PHYSICAL TESTING OF SPECIMENS AND A COMPREHENSIVE LITERATURE SEARCH WILL BE CONDUCTED TO ESTABLISH A CORRELATION BETWEEN VARIOUS ANOMALIES AND FLAWS (WHICH ARE QUANTIZED BY CT) AND THE DEGRADATION OF MATERIAL PROPERTIES. A LIMITED MATERIALS PROPERTY MODEL CORRELATING DENSITY AND SELECTED MECHANICAL PROPERTIES WILL BE DEVELOPED. THE FEASIBILITY OF USING CT DATA AS AN INPUT TO A FINITE ELEMENT ANALYSIS WILL BE INVESTIGATED.

PDA ENGINEERING 1560 BROOKHOLLOW DR SANTA ANA, CA 92705 H L MOODY TITLE: ANTENNA WINDOW CONCEPTS ADVANCEMENT T 164 OFFICE: AFWAL/ML	AF	\$ 49,974
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THE DEFICIENCIES IN CURRENT ANTENNA WINDOW MATERIALS AND DESIGN

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>METHODS RESTRICT THE PERFORMANCE GOALS OF CERTAIN ADVANCED AIR FORCE SYSTEMS. TO IMPROVE THE PERFORMANCE OF ANTENNA WINDOWS AND THEREFORE IMPROVE OVERALL SYSTEM EFFECTIVENESS, MATERIAL FORMULATIONS, MATERIAL CONSTRUCTIONS AND DESIGN METHODS WILL BE EVALUATED THAT SHOW PROMISE TO ENHANCING WINDOW RESPONSE. THE ABILITY TO TAILOR ANTENNA MATERIAL PROPERTIES BY CHANGING MATERIAL COMPOSITIONS AND WEAVE CONSTRUCTION WILL BE INVESTIGATED. IMPROVEMENTS IN ANTENNA SUPPORT STRUCTURE AND ADJACENT ANTENNA HEATSHIELD MATERIAL WILL BE REVIEWED.</p>		

PDA ENGINEERING 1560 BROOKHOLLOW DR SANTA ANA, CA 92705 H L MOODY TITLE: ANTENNA WINDOW INSTRUMENTATION FOR REENTRY VEHICLES T 188 OFFICE: BMO/MYSC	AF	\$ 49,995
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FOR CERTAIN AIR FORCE ADVANCED REENTRY APPLICATIONS, ANTENNA WINDOW PERFORMANCE HAS A CRITICAL ROLE IN DICTATING OVERALL SYSTEM EFFECTIVENESS. TO AID IN THE CHARACTERIZATION OF ANTENNA WINDOW PERFORMANCE, REENTRY DATA ARE NEEDED IN THE AREAS OF ABLATION, THERMAL, STRUCTURAL AND ELECTRICAL RESPONSE. IN THE PROPOSED PROGRAM, THREE INSTRUMENTATION CONCEPTS WILL BE DESIGNED TO SUPPORT THE ACQUISITION OF PERFORMANCE DATA IN THESE AREAS. LABORATORY TESTS WILL BE CONDUCTED ON TWO ABLATION SENSORS TO DETERMINE FEASIBILITY. DEMONSTRATION TESTS WILL BE PERFORMED ON A PROPOSED SENSOR THAT MEASURES BOTH ABLATION AND TEMPERATURE RESPONSE.

PDA ENGINEERING 1560 BROOKHOLLOW DR SANTA ANA, CA 92705 LIAM S GROENER TITLE: GAS COOLED NOSETIP DEVELOPMENT T 194 OFFICE: BMO/MYSC	AF	\$ 49,982
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THE FEASIBILITY AND PERFORMANCE LIMITS OF TRANSPIRATION COOLED NOSETIPS, (TCNT'S) USING A WARM GAS COOLANT WILL BE INVESTIGATED. SUCH CONCEPTS HAVE THE POTENTIAL OF COMBINING THE RELIABLE MAINTENANCE FREE COOLANT SUPPLY OF EXISTING GAS-JET NOSETIP CONCEPTS WITH THE

FISCAL YEAR 1986

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RELATIVELY PREDICTABLE PERFORMANCE AND ANGLE-OF-ATTACK CAPABILITIES OF WATER COOLED TCNT'S. THE PRESENT INVESTIGATION WILL INCLUDE DEVELOPMENT OF CONCEPTUAL DESIGNS, PERFORMANCE PREDICTIONS, AND ASSESSMENT OF FABRICATION FEASIBILITY/COSTS.

PDA ENGINEERING

AF

\$ 49,961

1560 BROOKHOLLOW DR

SANTA ANA, CA 92705

DR JOSEF E WUERER

TITLE:

DUST INDUCED LOADING ON A HARD MOBILE LAUNCHER

T 236

OFFICE: BMO/MYSC

THE RESPONSE OF A HARD MOBILE LAUNCHER (HML) IN A NUCLEAR AIRBLAST ENVIRONMENT IS STRONGLY DEPENDENT ON THE DRAG LOADS PRODUCED BY THE TWO PHASE FLUID-PARTICLE GUST BEHIND THE BLAST WAVE. THE OBJECTIVE OF THIS PROPOSED RESEARCH IS TO DEMONSTRATE THE FEASIBILITY OF CONDUCTING CREDIBLE AERO/DUST LOAD EXPERIMENTS IN A WIND TUNNEL TO SIMULATE THIS DRAG PHASE LOADING DURING A BLAST WAVE ENCOUNTER. THE PROPOSED APPROACH TO THIS EFFORT WILL INCLUDE THE FOLLOWING ACTIVITIES: (1) DEMONSTRATE THE ABILITY OF WIND TUNNELS TO SIMULATE CRITICAL ELEMENTS OF THE HML BLAST WAVE ENVIRONMENT, (2) DEVELOP APPROPRIATE SCALING PARAMETERS FOR COMBINED AERO/DUST LOADING FOR SUBSCALE EXPERIMENTS, (3) DEVELOP A PRELIMINARY DESIGN FOR A DUST LOADED FLOW GENERATOR, (4) DEMONSTRATE THE PERFORMANCE OF A PROTOTYPE DUST LOADED FLOW GENERATOR IN A CONTROLLED LABORATORY EXPERIMENT, AND (5) DEFINE INSTRUMENTATION REQUIREMENTS SPECIFIC TO PROVIDING (a) BODY FORCE MEASUREMENTS AND (b) FLOWFIELD DIAGNOSTICS FOR A DUST LOADED FLOW WIND TUNNEL TEST.

PDA ENGINEERING

ARMY

\$ 49,998

1560 BROOKHOLLOW DR

SANTA ANA, CA 92705

H M STOLLER

TITLE:

SURFACE ENERGETICS TAILORING TO IMPROVE REINFORCED THERMOPLASTIC COMPOSITES

T 41

OFFICE: AVSCOM/AMSAV

PLASMA TREATMENT OF POLYARAMID FILAMENTS WITH AMINES TO INDUCE



FISCAL YEAR 1986

SUBMITTED BY

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AMOUNT

SURFACE CHEMISTRY MODIFICATION HAS CREATED IMPROVED PERFORMANCE KEVLAR/EPOXY COMPOSITES. PERFORMANCE IMPROVEMENT HAS BEEN ATTRIBUTED TO THE DEVELOPMENT OF COVALENT BONDS, BUT LIMITED DATA SUGGESTS THAT THE SURFACE ENERGETICS COMPATIBILITY BETWEEN THE TWO CONSTITUENTS WAS ALSO ENHANCED. THIS WOULD HAVE ENHANCED INTERFACIAL ADHESION BY IMPROVING SECONDARY BONDING MECHANISMS. THE CURRENT APPROACH TO MEASURING SURFACE ENERGETICS IS INADEQUATE TO RESOLVE THIS ISSUE. SINCE THERMOPLASTICS DO NOT UNDERGO EXCHANGE REACTIONS, IMPROVED INTERFACIAL ADHESION WILL BE DEPENDENT UPON IMPROVEMENTS IN SURFACE ENERGETICS COMPATIBILITY. SURFACE CHEMISTRY MODIFICATION THROUGH PLASMA TREATMENT HAS THE POTENTIAL TO TAILOR THE SURFACE ENERGETICS OF REINFORCING FIBERS TO SURFACE ENERGY CHARACTERISTICS OF THERMOPLASTIC RESINS. TO EXPLOIT THIS POTENTIAL, AN IMPROVED METHOD OF DETERMINING SURFACE ENERGY COMPONENTS IS REQUIRED. THE WILHEMY TECHNIQUE WILL BE APPLIED TO FIBER AND RESIN SURFACE ENERGY MEASUREMENTS, EMPLOYING AN EXPANDED SUITE OF PROBE LIQUIDS, DIVIDED INTO THREE SURFACE ENERGY CLASSIFICATIONS. RESOLUTION OF SURFACE ENERGY COMPONENTS WILL BE OBTAINED. FORMULATION OF PLASMA TREATMENTS TO ACHIEVE IMPROVED SURFACE ENERGETICS COMPATIBILITY BETWEEN FIBERS AND RESINS WILL BE DEVELOPED.

PDA ENGINEERING  
1560 BROOKHOLLOW DR  
SANTA ANA, CA 92705  
PAUL C KOCHENDORFER

DNA

\$ 48,723

## TITLE:

IMPROVED HARDENED ANTENNA WINDOW STRUCTURAL INTEGRATION FOR  
MANEUVERING REENTRY VEHICLES

T 1 OFFICE: AM/SBIR

ADVANCED MANEUVERING REENTRY SYSTEMS REQUIRE INSTALLATION OF A LARGE PHASED ARRAY ANTENNA IN THE VEHICLE SHELL STRUCTURE. THE LARGE PHYSICAL SIZE OF THE REQUIRED CUTOUT COMBINED WITH THE SEVERE MANEUVERING AND NUCLEAR AIRBLAST LOADS PLACE SEVERE DEMANDS ON THE STRUCTURAL ATTACHMENT BETWEEN THE WINDOW AND VEHICLE. WEIGHT IS CRITICAL AND THE WINDOW ASSEMBLY MUST BE CAPABLE OF BEING REMOVED AND REINSTALLED. CONVENTIONAL METHODS OF STRUCTURAL ATTACHMENT OF COMPOSITE MATERIALS ARE REVIEWED AND FOUND WANTING. A NEW AND NOVEL METHOD IS PRESENTED AND A PROGRAM PROPOSED TO INVESTIGATE ITS FEASIBILITY. THE PROGRAM INCLUDES A LIMITED ANALYTICAL ASSESSMENT COMBINED WITH AN ITERATIVE TEST SERIES USING A STANDARD TENSILE TEST

FISCAL YEAR 1986

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MACHINE, AND A SPECIAL JOINT TEST APPARATUS.

PDA ENGINEERING 1560 BROOKHOLLOW DR SANTA ANA, CA 92705 DR JOSEF E WUERER TITLE: ANALYSIS OF SHORT WAVELENGTH LASER/MATERIAL INTERACTION EFFECTS T 4 OFFICE: AM/SBIR	DNA	\$ 83,496
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THE DEPARTMENT OF DEFENSE IS ALLOCATING SIGNIFICANT RESOURCES TO EXPLORE DEVELOPMENT OF NOVEL SHORT WAVELENGTH LASER (SWL) CONCEPTS INTO WEAPON GRADE SYSTEMS. THE DESIGN GOALS FOR THESE WEAPONS HAVE BEEN ESTABLISHED LARGELY ON THE BASIS OF LETHALITY DATA OBTAINED WITH IR LASERS. IN THE PROPOSED PROGRAM, THE POTENTIAL OF HARDENING RESPONSIVE TARGETS WITH CONCEPTS TAILORED SPECIFICALLY TO COUNTER SHORT WAVELENGTH LASERS WILL BE EXPLORED ANALYTICALLY. THE EXPERIMENTAL EFFORT REQUIRED FOR AN EARLY VALIDATION OF SWL/MATERIALS INTERACTION EXPERIMENTAL RESULTS ALSO WILL BE ADDRESSED.

PEM RESEARCH CO 3104 ROBERTA DR LARGO, FL 33541 DR RICHARD KENT SPEARS TITLE: EVALUATION OF HIGH TEMPERATURE ADHESIVE FOR REENTRY VEHICLES T 197 OFFICE: BMO/MYSC	AF	\$ 50,000
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THE NORTON AIR FORCE BASE EXPRESSED A NEED FOR A HIGH TEMPERATURE ADHESIVE SYSTEM FOR REENTRY VEHICLES. THE ADHESIVE WILL BE BONDED TO ALUMINUM, CARBON FIBERS AND SILICA MATERIALS. IT IS PROPOSED THAT COMMERCIAL SOURCES BE EXPLORED INITIALLY TO DETERMINE IF ANY WILL MEET THESE REQUIREMENTS. THEN IF NONE IS FOUND THAT AN ADHESIVE BE FORMULATED. THIS WILL BE PERFORMED WITH THE ASSISTANCE OF INDUSTRIAL, GOVERNMENT AND UNIVERSITY STAFF PERSONNEL. THE STUDY HAS BEEN SEPARATED INTO NINE TASK OBJECTIVES. THESE WILL SPECIFICALLY STUDY SELECTED ADHESIVE SYSTEMS FOR THE REQUIREMENTS LISTED BY THE AIR FORCE. ONE OF THE TASKS INVOLVED AN EXAMINATION OF THE SURFACE PREPARATION OF THE COMPOSITES TO BE USED IN THIS STUDY. THE GOVERNING CRITERIA OF MOST EXAMINATIONS WILL BE THE LAP SHEAR TEST. IN THE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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INITIAL STUDIES STELL COUPONS WILL BE USED TO ELIMINATE THE VARIABLE OF THE COMPOSITE AND REDUCE COSTS. WE FEEL THAT THIS IS AN IMPORTANT ASPECT OF ADHESIVE BONDING AND OUR TECHNICAL STAFF IS EXPERIENCED IN EVALUATION AND SELECTION OF AN OPTIMUM METHOD OF SURFACE PREPARATION.

PENGUIN SOFTWARE INC  
7005 E SPRING ST  
LONG BEACH, CA 90808  
THOMAS H WEIGHT

ARMY \$ 40,800

## TITLE:

HIGH ORDER LANGUAGE BASED ON MACRO'S FOR AUTOMATED MICROCODE GENERATION

T 165

OFFICE: TECOM/WSMR

PENGUIN SOFTWARE HAS PROPOSED TO DELIVER AN END TO END DEMONSTRATION OF OUR APPROACH TO MICROCODE COMPILERS. ATTENTION WILL BE FOCUSED ON EXPLOITING PENGUIN SOFTWARE'S EXPERTISE IN MACHINE DEPENDENT LANGUAGES, RETARGETING, AND COMPACT BUT EFFICIENT DATA STRUCTURES. MACHINE DEPENDENT LANGUAGES WILL BE USED TO ALLOW AN ENGINEER TO INCORPORATE KNOWLEDGE OF MACHINE PARALLELISM. EASE OF RETARGETING AND LANGUAGE DEFINITION WILL BE ACHIEVED BY USING A COMPILER DURING THE LANGUAGE DEFINITION PHASE AS WELL AS DURING THE MICROCODE GENERATION. DURING RECENT YEARS, PENGUIN SOFTWARE HAS CONDUCTED RESEARCH TO DEVELOP DATA STRUCTURES AND ALGORITHMS SUITABLE FOR USE IN A MICROCODE COMPILER WHICH CAN RUN ON A PERSONAL COMPUTER. THESE EFFORTS HAVE RESULTED IN THE CAPABILITY OF GENERATING A MICROCODE COMPILER WHICH WILL RUN ON AN IBM AT AND WILL EXECUTE IN TIMES COMPETITIVE WITH PRESENT DAY META-ASSEMBLERS. AN EXISTING LR(N) COMPILER WILL BE MODIFIED TO DEMONSTRATE THE FEASIBILITY OF PENGUIN SOFTWARE'S OVERALL APPROACH.

PERCEPTICS CORP  
PELLISSIPPI CTR  
KNOXVILLE, TN 37922  
DR R C GONZALEZ

AF \$ 48,868

## TITLE:

EXPERT SYSTEM FOR PILOT DECISION AIDING

T 116

OFFICE: AFWAL/AA

A SYSTEM IS PROPOSED FOR UTILIZING EXPERT KNOWLEDGE TO AUTOMATICALLY

FISCAL YEAR 1986

SUBMITTED BY

DEPT

AWARDED  
AMOUNT

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GENERATE DECISION TREES WITH APPLICATIONS IN PILOT DECISION AIDING. THE PROPOSED WORK REPRESENTS THE FIRST FORMALIZED ATTEMPT TO COMBINE EXPERT SYSTEM TECHNOLOGY AND AUTONOMOUS DECISION MAKING FOR TASKS SUCH AS COMPUTER VISION, PATTERN RECOGNITION, AND INTELLIGENT CONTROL. IN THE PROPOSED SYSTEM, A KNOWLEDGE BASE CONSISTING OF A SET OF PRODUCTION RULES IS CREATED BY THE USER. FROM THE KNOWLEDGE BASE, THE SYSTEM CAN THEN AUTOMATICALLY CREATE A DECISION TREE REPRESENTATION OF THE SOLUTION TO THE PROBLEM THAT SATISFIES A SPECIFIED OPTIMALITY CRITERION. FROM THAT OPTIMAL REPRESENTATION OF THE TREE, A HIGH LEVEL LANGUAGE IMPLEMENTATION IS THEN GENERATED. IF THE KNOWLEDGE BASE IS MODIFIED, THE SYSTEM PRODUCES A NEW DECISION TREE THAT INCORPORATES ALL THE CHANGES. THIS MEANS THAT THE USER DOES NOT HAVE TO WORRY ABOUT THE ACTUAL GENERATION, IMPLEMENTATION AND VISUALIZATION OF THE TREE. THE RESULT WILL BE A PROBLEM-SOLVING APPROACH WHERE CONCEPTUAL AND EXPERT KNOWLEDGE, RATHER THAN HEURISTIC DETAILS, WILL BE THE DRIVING FORCE. THE PROBABILITY OF SUCCESS OF PHASE I IS HIGH BECAUSE MOST OF THE BACKGROUND WORK FOR DEMONSTRATING FEASIBILITY HAS BEEN DONE AND PARTS OF THE SYSTEM HAVE ALREADY BEEN IMPLEMENTED.

PERCEPTICS CORP  
PELLISSIPPI CTR  
KNOXVILLE, TN 37922  
DR R C GONZALEZ

AF

\$ 49,872

## TITLE:

EXPERT SYSTEM FOR AUTOMATIC DECISION MAKING IN TARGET DETECTION  
AND CLASSIFICATION

T 226

OFFICE: BMO/MYSC

A SYSTEM IS PROPOSED FOR UTILIZING EXPERT KNOWLEDGE TO AUTOMATICALLY GENERATE DECISION TREES WITH APPLICATIONS IN TARGET DETECTION AND CLASSIFICATION. THE PROPOSED WORK REPRESENTS THE FIRST FORMALIZED ATTEMPT TO COMBINE EXPERT SYSTEM TECHNOLOGY AND AUTONOMOUS DECISION MAKING FOR TASKS SUCH AS COMPUTER VISION, PATTERN RECOGNITION, AND INTELLIGENT CONTROL. IN THE PROPOSED SYSTEM, A KNOWLEDGE BASE CONSISTING OF A SET OF PRODUCTION RULES IS CREATED BY THE USER. FROM THE KNOWLEDGE BASE, THE SYSTEM CAN THEN AUTOMATICALLY CREATE A DECISION TREE REPRESENTATION OF THE SOLUTION TO THE PROBLEM THAT SATISFIES A SPECIFIED OPTIMALITY CRITERION. FROM THAT OPTIMAL REPRESENTATION OF THE TREE, A HIGH LEVEL LANGUAGE IMPLEMENTATION IS THEN GENERATED. IF THE KNOWLEDGE BASE IS MODIFIED, THE SYSTEM PRODUCES A NEW DECISION TREE THAT INCORPORATES ALL THE CHANGES. THIS MEANS THAT THE

FISCAL YEAR 1986

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USER DOES NOT HAVE TO WORRY ABOUT THE ACTUAL GENERATION, IMPLEMENTATION AND VISUALIZATION OF THE TREE. THE RESULT WILL BE A PROBLEM-SOLVING APPROACH WHERE CNCEPTUAL AND EXPERT KNOWLEDGE, RATHER THAN HEURISTIC DETAILS, WILL BE THE DRIVING FORCE. THE PROBABILITY OF SUCCESS OF PHASE I IS HIGH BECAUSE MOST OF THE BACKGROUND WORK FOR DEMONSTRATING FEASIBILITY HAS BEEN DONE AND PARTS OF THE SYSTEM HAVE ALREADY BEEN IMPLEMENTED.

PERCEPTICS CORP PELLISSIPPI CENTER KNOXVILLE, TN 37922 DR R C GONZALEZ TITLE: EXPERT SYSTEM FOR AUTOMATIC GENERATION OF DECISION TREE CLASSIFIERS FOR VIDEOTAPE READING T 172 OFFICE: TECOM/WSMR	ARMY	\$ 49,506
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A SYSTEM IS PROPOSED FOR UTILIZING EXPERT KNOWLEDGE TO AUTOMATICALLY GENERATE DECISION TREES WITH APPLICATIONS IN AUTOMATED VIDEOTAPE READING. THE PROPOSED WORK REPRESENTS THE FIRST FORMALIZED ATTEMPT TO COMBINE EXPERT SYSTEM TECHNOLOGY AND AUTONOMOUS DECISION MAKING FOR TASKS SUCH AS COMPUTER VISION, PATTERN RECOGNITION, AND INTELLIGENT CONTROL. IN THE PROPOSED SYSTEM, A KNOWLEDGE BASE CONSISTING OF A SET OF PRODUCTION RULES IS CREATED BY THE USER. FROM THE KNOWLEDGE BASE, THE SYSTEM CAN THEN AUTOMATICALLY CREATE A DECISION TREE REPRESENTATION OF THE SOLUTION TO THE PROBLEM THAT SATISFIES A SPECIFIED OPTIMALITY CRITERION. FROM THAT OPTIMAL REPRESENTATION OF THE TREE, A HIGH LEVEL LANGUAGE IMPLEMENTATION IS THEN GENERATED. IF THE KNOWLEDGE BASE IS MODIFIED, THE SYSTEM PRODUCES A NEW DECISION TREE THAT INCORPORATES ALL THE CHANGES. THIS MEANS THAT THE USER DOES NOT HAVE TO WORRY ABOUT THE ACTUAL GENERATION, IMPLEMENTATION AND VISUALIZATION OF THE TREE. THE RESULT WILL BE A PROBLEM-SOLVING APPROACH WHERE CONCEPTUAL AND EXPERT KNOWLEDGE, RATHER THAN HEURISTIC DETAILS, WILL BE THE DRIVING FORCE. THE PROBABILITY OF SUCCESS OF PHASE I IS HIGH BECAUSE MOST OF THE BACKGROUND WORK FOR DEMONSTRATING FEASIBILITY HAS BEEN DONE AND PARTS OF THE SYSTEM HAVE ALREADY BEEN IMPLEMENTED.

PERCEPTRONICS INC 214 E HURON ST ANN ARBOR, MI 48104 DEAN Z DOUTHAT TITLE: DECISION METHODOLOGY IN THE NAVAL SHIP PARADIGM ARCHITECTURES T 277 OFFICE: AMD/RDO	AF	\$ 66,381
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PROCESS ARCHITECTURE FOR INTELLIGENT SYSTEMS USING CONVENTIONAL AND

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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NON-CONVENTIONAL ARTIFICIAL INTELLIGENCE TECHNOLOGY IS DEFINED. THE ARCHITECTURE IS DERIVED FROM A PARADIGM KNOWN AS THE NAVAL SHIP PARADIGM SUGGESTED AS A GUIDING PARADIGM FOR MACHINE INTELLIGENCE SYSTEMS. THE ARCHITECTURE IS SHOWN TO BE A RECURSIVE HIERARCHY OF THE ELEMENTAL PROCESS OF SENSE-THINK-ACT. ELEMENTS OF DECISION MAKING WITHIN THE ARCHITECTURE ARE DEFINED AND THEIR RELATIONSHIP AND CRITICALITY TO THE PROCESS ILLUSTRATED. IT IS SHOWN THAT THE MAJORITY OF DECISIONS DEAL WITH MODELS AKIN TO MENTAL MODELS IN HUMANS. MODEL CHARACTERISTICS ARE DEVELOPED AND THEIR IMPACT ON DECISIONS DISCUSSED. THE PROPOSED STUDY IS DESIGNED TO ELABORATE ON AND, WHERE POSSIBLE, QUANTIFY THESE ISSUES AND IDENTIFY SPECIFIC PROBLEM AREAS FOR FURTHER RESEARCH. A PHASE II PROGRAM PLAN TO CONDUCT THE RESEARCH INCLUDING DEVELOPMENT OF COMPUTER PROGRAMS FOR ELEMENTS OF INTELLIGENT SYSTEMS WILL ALSO BE DEVELOPED.

PERFORMANCE METRICS INC  
5825 CALLAGHAN - STE 225  
SAN ANTONIO, TX 78228  
DR BENJAMIN A FAIRBANK JR  
TITLE:

AF

\$ 49,907

PERFORMANCE ASSESSMENT AND MEASUREMENT MODULE  
T 282 OFFICE: AMD/RDO

THREE FACETS OF A PROGRAM OF RESEARCH AND DEVELOPMENT IN SUPPORT OF AN ADVANCED PILOT TRAINING SYSTEM ARE PROPOSED. THE FIRST FACET IS THE DETERMINATION OF THE REQUIREMENTS FOR AND ELEMENTS OF AN ENTIRELY NEW SYSTEM OF WITHIN SUBJECTS PSYCHOMETRICS DESIGNED TO DEVELOP MEASURES AND TECHNIQUES FOR DIFFERENTIATING BETWEEN ABILITIES AND PERFORMANCE LEVELS OF INDIVIDUALS ON DIFFERENT DAYS. THE SECOND FACET IS A SCORING SYSTEM WHICH WILL BE USABLE FOR EVALUATING PERFORMANCE ON A WIDE VARIETY OF COGNITIVE, JUDGMENTAL, AND PERFORMANCE TESTS AND TASKS. IT WILL CONTAIN TECHNIQUES BASED ON CLASSICAL AND MODERN PSYCHOMETRICS AND ON ANALYTICAL STRATEGIES WHICH ARE USED IN THE STUDY OF COGNITIVE PROCESSES. THE THIRD FACET IS THE DEVELOPMENT OF SPECIFICATIONS FOR AN INPUT/OUTPUT MODULE WHICH WILL INTERFACE WITH THE TESTING APPARATUS, CONTROL THE FLOW OF DATA TO AND FROM TWO DATA BASES (ONE OF SUMMARY DATA AND ONE ARCHIVALLY COMPLETE), AND PREPARE SUMMARY REPORTS TO EXAMINEE PERFORMANCE.

PFEFFERLE W C ASSOCS  
51 WOODLAND DR  
MIDDLETOWN, NJ 07748  
DR WILLIAM PFEFFERLE  
TITLE:

ARMY

\$ 49,887

LOW NOISE CATALYTIC DIESEL ENGINE  
T 99 OFFICE: BRDC

DIESEL ENGINES ARE NOTICEABLY NOISIER THAN SPARK IGNITION ENGINES.

AD-A195 204

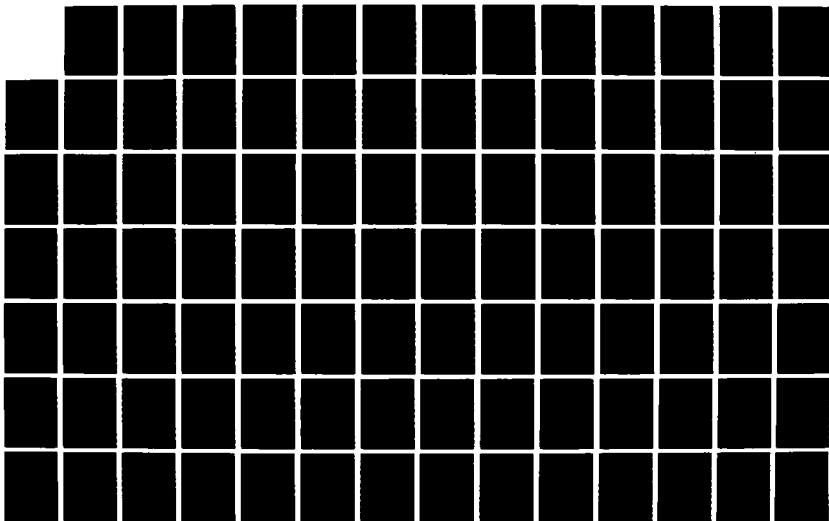
DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
(S&IR) ABSTRACTS OF PHASE I AWARDS (1986)(U) DEPARTMENT  
OF DEFENSE WASHINGTON DC 1986

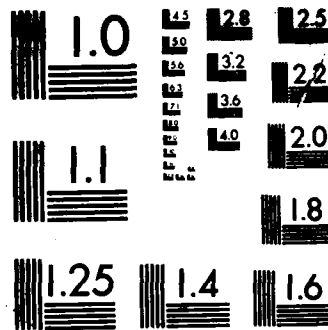
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MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A



FISCAL YEAR 1986

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<p>AS A RESULT, MILITARY USE OF THE FUEL-EFFICIENT DIESEL ENGINE FOR ELECTRICAL POWER GENERATION PURPOSES INCREASES THE NOISE-ABATEMENT PROBLEM. THE RESULTING INCREASED RISK OF ENEMY DETECTION FROM DIRECT-INJECTION MILITARY DIESELS PLACES A HIGH VALUE ON METHODS OF REDUCING THE COMBUSTION NOISE. WILLIAM C. PFEFFERLE ASSOCIATES (WCP) HAS INVENTED A PROPRIETARY CATALYTICALLY-ENHANCED MODIFICATION OF A DIESEL ENGINE WHICH OFFERS A NUMBER OF PROMISING FEATURES, INCLUDING SIGNIFICANTLY-REDUCED COMBUSTION NOISE LEVELS. USING CATALYSTS PLACED PERMANENTLY IN THE COMBUSTION CHAMBER OF A DIESEL ENGINE, WCP HAS DEMONSTRATED RAPID CONSTANT-VOLUME COMBUSTION OF DIESEL FUEL ACCOMPANIED BY A NOTICEABLY-LOWER NOISE LEVEL (CONFIRMED BY A PRESSURE TRACE WITHOUT HIGH FREQUENCY OSCILLATIONS) AND A COMBUSTION CHAMBER FREE OF VISIBLE SOOT. WE BELIEVE THIS SYSTEM CAN INEXPENSIVELY BUT SIGNIFICANTLY LOWER NOISE EMISSIONS IN FIELD DIESEL GENERATORS (AS WELL AS OTHER MILITARY DIESELS) WHILE IMPROVING FUEL ECONOMY AND POWER AND ALSO OFFERING OTHER IMPORTANT ADVANTAGES NOT WITHIN THE SCOPE OF THIS RFP. THIS PHASE I STUDY WILL CONDUCT FEASIBILITY EXPERIMENTATION TO MEASURE THE NOISE LEVEL REDUCTION OF THIS CATALYTIC DIESEL AT VARIOUS OPERATING CONDITIONS.</p>		

PHASEX CORP 287 EMERSON RD LEXINGTON, MA 02173 VAL KRUKONIS TITLE: A PROCESS TO PRODUCE IMPROVED RDX CRYSTALS - EXPLORATORY DEVELOPMENT	ARMY	\$ 68,192
T 142	OFFICE: LABCOM/BRL	

RDX CRYSTALS OF 100-150 MICROMETER SIZE EXHIBIT INTRAGRANULAR CAVITIES THAT DERIVE FROM THE CYCLOHEXANONE PRECIPITATION PROCESS AND THAT MAY AFFECT THE SENSITIVITY OF EXPLOSIVE FORMULATIONS CONTAINING RDX. DEVELOPMENT ON A NEW PROCESS USING SUPERCRITICAL FLUIDS IS DESCRIBED. THE PROCESS IS BASED UPON THE ABILITY OF A SUPERCRITICAL FLUID TO DISSOLVE IN AN ORGANIC LIQUID SOLUTION OF SOLID AND CAUSE PRECIPITATION OF THE SOLID. THE OBJECTIVES OF THE PROGRAM ARE: 1. DETERMINE THE RANGE OF PARAMETERS THAT WILL RESULT IN THE FORMATION OF 100-150 MICROMETER RDX FREE OF INTRAGRANULAR CAVITIES. 2. PRODUCE 1-2 KGS OF RDX CRYSTALS. 3. PREPARE A FLOW CHART AND CARRY OUT A PRELIMINARY ECONOMIC ASSESSMENT OF THE SUPERCRITICAL FLUID NUCLEATING PROCESS.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
PHONETIGRAPHICS INC 7819 E GREENWAY RD - #3 SCOTTSDALE, AZ 85260 JOHN MARLEY TITLE: A PHONETIC ANALYSIS METHOD TO AMELIORATE THE EFFECTS OF SPEAKER VARIATIONS IN VOICE COMMAND SYSTEMS T 178 OFFICE: TECOM/AVDTA	ARMY	\$ 49,879

A NOVEL SIGNAL PROCESSING AND PHONETIC ANALYSIS SYSTEM OPERATING IN THE TIME DOMAIN IS PROPOSED WHICH AVOIDS THE COSTLY AND TIME-CONSUMING MATHEMATICAL SOFTWARE FILTERING SCHEMES OFTEN USED. THE PITCH SYNCHRONOUS RATIOMETRIC FACTORS REPRESENTING PHONEMIC ELEMENTS OF SPEECH ARE SEPARATED FROM THE SPORADIC NOISE AND CERTAIN PERSONALITY VARIABLE FEATURES. THE PURIFIED STRING OF ENCODED PHONETIC ELEMENTS IS PROPOSED AS INPUT TO A VOICE COMMAND SYSTEM BASED ON A SPEAKER INDEPENDENT LEXICON OF PHONETICALLY ORGANIZED WORD AND CONNECTED PHRASES WHICH IS RATHER INSENSITIVE TO SPEAKER STRESS AND BACKGROUND NOISE.

PHOTOFABRICATION TECHNOLOGY, INC. P.O. BOX 3209 DERRY, NH 03038 ROBERT E. HOWE TITLE: OPTIMIZING FOCAL PLANE INTERCONNECTIONS T 3 OFFICE:	SDIO	\$ 49,148
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THE GOAL OF THE PROPOSED PHASE I AND SUBSEQUENT PHASE II EFFORT IS TO PROVIDE OPTIMIZED FOCAL PLANE CABLE INTERCONNECTIONS IN FAR-IR FOCAL PLANE ARRAYS. AN INFORMAL SURVEY OF CONTRACTORS HAS CONFIRMED THAT THERE IS A GENERAL NEED FOR MORE DETAILED PERFORMANCE AND RELIABILITY DATA AND THAT THE DESIGN OF SUCH LWIR SYSTEMS WOULD BENEFIT FROM THE PROPOSED EFFORT. THE SPECIFIC OBJECTIVE OF THIS PHASE I PROPOSAL IS TO DEFINE, THROUGH SURVEY AND PRELIMINARY TESTING, THE PRIMARY DESIGN AND PERFORMANCE GOALS OF A BASELINE "GENERIC" FOCAL PLANE CABLE TO BE FABRICATED AND EVALUATED UNDER A PHASE II EFFORT.

PHOTOMETRICS INC 4 ARROW DR WOBURN, MA 01801 GILBERT DAVIDSON TITLE: CO2 LASER RADAR FOR DETECTION OF GUERRILLA PERSONNEL AND VEHICLES T 31 OFFICE: AD/YQT	AF	\$ 49,933
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THIS PROPOSAL DESCRIBES A COHERENT CO2 LASER RADAR SYSTEM (I.E.

FISCAL YEAR 1986

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<p>HETERODYNE DETECTION IS EMPLOYED) THAT WILL PERMIT THE DETECTION OF INDIVIDUAL COMBATANTS (GUERRILLA PERSONNEL), VEHICLES, AND LOW FLYING AIRCRAFT, IN A CLUTTERED ENVIRONMENT, DAY OR NIGHT AND IN FOUL WEATHER. THE SYSTEM CAN BE COMPACT, RUGGED AND WILL CONSUME LITTLE POWER. THE SMALL RUGGED FEATURES OF THE SYSTEM RESULT FROM THE USE OF AN AIR-COOLED, COMPACT CO2 LASER. IN ADDITION, THE USE OF THE CW-FM WAVEFORM THAT FREQUENTLY IS EMPLOYED IN CLASSICAL RADIO FREQUENCY RADAR SYSTEMS (ALSO THE SIGNAL PROCESSING TECHNIQUE EMPLOYED BY SOME SPECIES OF BATS), WILL BE SHOWN TO RESULT IN DESIRABLE CLUTTER REJECTION PERFORMANCE AND TO PROVIDE SIMULTANEOUS RANGE AND VELOCITY INFORMATION ABOUT THE TARGET.</p>		

PHYSICAL OPTICS CORP. 3306 DOW AVE. REDONDO BEACH, CA 90278 JOANNA JANNSON, PHD TITLE: HOLOGRAPHIC FILTERS WITH ULTRA WIDE ANGLE OF PROTECTION FOR OPTICAL COUNTERMEASURES T 7 OFFICE:	SDIO	\$ 80,649
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THE PROPOSED RESEARCH ENTAILS A NEW TECHNOLOGY OF FABRICATING HOLOGRAPHIC LASER COUNTERMEASURE FILTERS IN PROVIDING A WIDER OPERATING ANGLE OF REJECTION AGAINST INCIDENT LASER THREATS. UNLIKE EXISTING HOLOGRAPHIC FILTERS, THIS IMPROVEMENT IN ANGULAR PERFORMANCE IS OBTAINED WITHOUT ANY SACRIFICE IN THE BLOCKAGE CAPABILITY (OPTICAL DENSITY) AGAINST THE LASER LINES. IN ADDITION, THE PHOTOPIC AND SCOTOPIC EFFICIENCIES OF THIS NEW TYPE OF HOLOGRAPHIC FILTERS ARE ALSO MUCH HIGHER THAN THOSE OF EXISTING APPROACHES. THE NET RESULT IS A HOLOGRAPHIC LASER COUNTERMEASURE SYSTEM THAT HAS SIMULTANEOUSLY ALL THE DESIRABLE PROPERTIES OF AN IDEAL DEVICE: STRONG LASER BLOCKAGE (WITH MINIMUM ABSORPTION), WIDE OPERATING ANGLE, MULTIWAVELENGTH PROTECTION, AND HIGH SEE-THROUGH CAPABILITY. THE PROGRAM WILL INVESTIGATE AND DEMONSTRATE THE FEASIBILITY OF THIS TECHNOLOGY WITH THE FABRICATION OF A PROTOTYPE. SUCH NEW HOLOGRAPHIC FILTERS CAN BE PRODUCED IN MASS QUANTITIES, AND THEIR ENGINEERING AND PRODUCTION DEVELOPMENT WILL BE THE SUBJECT OF INVESTIGATION FOR SUBSEQUENT PHASES OF THE PROGRAM.

PHYSICAL RESEARCH INC 655 DEEP VALLEY DR - STE 320 PALOS VERDES, CA 90274 DR C WANG TITLE: AN EVAPORATION SMOKE GENERATOR T 289 OFFICE: AEDC/DOT	AF	\$ 49,940
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A SMOKE GENERATOR INCORPORATING THE TECHNIQUES OF LIQUID VAPORIZA-

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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TION, CRYOGENIC COOLING, AND MICROPROCESSOR CONTROL WILL BE DEVELOPED. THE SMOKE GENERATOR WILL BE OPERABLE UNDER BOTH ATMOSPHERIC AND ELEVATED PRESSURES. LIQUID VAPORIZATION WILL BE ACHIEVED BY CONTROLLED FILM-BOILING. PRESSURIZED NITROGEN GAS WILL BE USED TO OPERATE A LIQUID NITROGEN ATOMIZER TO PRODUCE NITROGEN MIST REQUIRED FOR COOLING THE VAPOR AND THE PRODUCTION OF SMOKE. WIND TUNNEL EXPERIMENTS WILL BE PERFORMED TO DETERMINE THE PERFORMANCE OF THE SMOKE GENERATOR. THE VISIBILITY OF THE SMOKE GENERATED WILL BE MEASURED PHOTOGRAPHICALLY. THE EFFECTS OF DIFFERENT SMOKE PRODUCING LIQUIDS, THE EFFECTS OF DIFFERENT VAPOR MIXING RATIOS, AND THE EFFECTS OF DIFFERENT SMOKE INJECTION SPEEDS ON THE VISIBILITY AND THE PERSISTENCE OF THE SMOKE WILL ALL BE EXPLORED. THE SMOKE GENERATOR WILL BE INTEGRATED WITH A MICROPROCESSOR CONTROLLER FOR THE PURPOSE OF AUTOMATIC CONTROL. THE SPEED OF THE SMOKE AND THE SPEED OF THE FLOW OF INTEREST WILL BE SIMULTANEOUSLY MONITORED. THE MICROPROCESSOR CONTROLLER WILL ALSO BE USED TO CONTROL THE SMOKE INJECTION SPEED AND TO SEQUENCE THE FUNCTIONING OF THE SMOKE GENERATOR.

PHYSICAL RESEARCH INC  
655 DEEP VALLEY DR - STE 320  
PALOS VERDES, CA 90274  
DR REZA TOOSI

ARMY \$ 50,002

## TITLE:

TEMPERATURE DETERMINATION WITHIN A HOT GAS/ATMOSPHERIC MIXTURE  
T 146 OFFICE: LABCOM/BRL

THE DEVELOPMENT OF AN UNSTEADY TWO-DIMENSIONAL FINITE-DIFFERENCE NAVIER-STOKES COMPUTER CODE TO CALCULATE THE FLOW FIELD OF AN ENGINE EXHAUST INTERACTING WITH AN UNSTEADY VORTEX WAKE, AND SUBSEQUENT DETERMINATION OF ITS INFRARED (IR) SIGNATURE IS PROPOSED. THE PROPOSED CODE WILL COMPUTE VELOCITY, TEMPERATURE, TURBULENCE STRUCTURE, AND CHEMICAL SPECIES CONCENTRATION FIELDS WHICH WILL BE INPUT TO A SECOND CODE TO CALCULATE THE IR RADIANCE ALONG ANY ARBITRARY LINE OF SIGHT. IN ADDITION, A DETAILED INVESTIGATION OF THE EXISTING EXPERIMENTAL DATA-BASE WILL BE CARRIED OUT AND COMPARISONS BETWEEN THE EXPERIMENTAL DATA AND CODE PREDICTIONS WILL BE MADE.

PHYSICAL RESEARCH INC  
655 DEEP VALLEY DR - STE 320  
PALOS VERDES, CA 90274  
WARREN A SCHLUETER

DNA \$ 47,797

## TITLE:

PHYSICAL/CHEMICAL MODELS FOR EXTRAPOLATION OF MEASURED FIREBALL STRUCTURE TO NON-VISIBLE WAVELENGTHS  
T 1 OFFICE: AM/SBIR

PROPOSED MILITARY OPTICAL SENSOR SYSTEMS WILL OPERATE IN ENVIRONMENTS

FISCAL YEAR 1986

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WITH STRUCTURED EMITTING BACKGROUNDS PRODUCED BY NUCLEAR WEAPON BURSTS. IN GENERAL, THESE OPTICAL SENSORS WILL OPERATE AT NON-VISIBLE WAVELENGTHS FOR WHICH THERE HAVE BEEN NO MEASUREMENTS OF NUCLEAR PRODUCED BACKGROUNDS. MODELS OF AVERAGE NUCLEAR PRODUCED BACKGROUNDS HAVE BEEN DEVELOPED FROM THEORETICAL MODELS OF VOLUME EMISSION AND RADIANCE CALCULATIONS WHICH INCLUDE OPTICAL RADIATION TRANSPORT EFFECTS. THE EFFECT OF OPTICAL STRUCTURE IS MODELED THROUGH KNOWLEDGE OF PARAMETERS DESCRIBING THE STRUCTURE POWER SPECTRAL DENSITY (PSD). HOWEVER, ALL PSD CHARACTERISTICS HAVE BEEN OBTAINED FROM PHOTOGRAPHS IN VISIBLE WAVELENGTHS. THE DEVELOPMENT OF MODELS RELATING OBSERVED STRUCTURE PARAMETERS IN VISIBLE WAVELENGTHS TO NON-VISIBLE WAVELENGTHS IS OF HIGH IMPORTANCE. ALSO OF HIGH INTEREST FOR POSSIBLE DISCRIMINATION ALGORITHMS IS BAND-TO-BAND CORRELATION OF NON-VISIBLE WAVELENGTH EMISSIONS; MODEL OF SUCH CORRELATIONS ARE NEEDED FOR GENERAL BURST ALTITUDE/YIELD COMBINATIONS. SUCH MODELS CAN BE INCORPORATED INTO DNA/RAAE COMPUTER CODE SIMULATIONS OF NUCLEAR WEAPONS EFFECTS.

PHYSICAL RESEARCH INC  
655 DEEP VALLEY DR - STE 320  
PALOS VERDES, CA 90274  
DANIEL A MATUSKA

DNA

\$ 49,744

TITLE:

APPLICATION OF ADVANCED COMPUTER RESOURCES TO PLASMA PHYSICS CODES  
T 1 OFFICE: AM/SBIR

AT PRESENT, COMPUTERS ARE AVAILABLE WITH ENORMOUS QUANTITIES OF CORE STORAGE AND EXTREMELY FAST COMPUTATIONAL CAPABILITIES AS COMPARED WITH COMPUTERS JUST A FEW YEARS OLD. IN THE NEXT YEAR OR TWO, EVEN MORE DRAMATIC INCREASES IN MEMORY AND COMPUTATIONAL SPEED WILL BECOME AVAILABLE. OF IMPORTANCE TO DNA/RAAE IS THE FACT THAT THESE NEW COMPUTERS WILL ALLOW THE CALCULATION OF HIGH ALTITUDE NUCLEAR WEAPONS EFFECTS WHICH ARE PRESENTLY INADEQUATELY TREATED DUE TO THE INHERENT APPROXIMATIONS AND SIMPLIFICATIONS CONTAINED IN EXISTING COMPUTER CODES. THE PROPOSED RESEARCH WILL RESULT IN AN IMPROVED TREATMENT OF EARLYTIME PHENOMENOLOGY FOLLOWING MEGATON BURSTS AT ABOUT 200 km ALTITUDE WHICH NEEDS TO BE TREATED IN A FIRST-PRINCIPLES CODE AND WHICH CAN BE INCLUDED IN A CODE SPECIFICALLY ORGANIZED TO TAKE ADVANTAGE OF CORE SIZE AND CPU SPEED WHICH IS AVAILABLE IN TODAY'S STATE-OF-THE-ART COMPUTERS. THE PROPOSED TECHNICAL APPROACH IS TO REVIEW THE CHARACTERISTICS OF ADVANCED COMPUTER HARDWARE, REVIEW RE-

FISCAL YEAR 1986

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LEVANT PHYSICS AND CHEMISTRY AND FORMULATE MODELS FOR IMPLEMENTATION ON A CANDIDATE COMPUTER, AND FORMULATE A PLASMA PHYSICS CODE ARCHITECTURE.

PHYSICAL SCIENCES INC PO BOX 3100 - RESEARCH PK ANDOVER, MA 01810 HARTMUT H LEGNER TITLE: WAKE TURBULENCE MODEL T 135 OFFICE: AFWAL/FI	AF	\$ 49,476
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A RESEARCH PROGRAM IS PROPOSED TO DEVELOP THE METHODOLOGY FOR A WAKE TURBULENCE MODEL THAT TAKES INTO ACCOUNT THE INTERACTION BETWEEN LARGE-SCALE, LOW FREQUENCY, AND SMALL-SCALE, HIGH FREQUENCY COMPONENTS OF TURBULENT FLOW. THE MODEL WILL BE CONSTRUCTED BY FORMULATING THE GOVERNING EQUATIONS FOR THE BEHAVIOR OF THE LARGE-SCALE STRUCTURE, COMBINED WITH EXISTING MODELS FOR THE EFFECT OF THE BACKGROUND TURBULENCE. A STANDARD WAKE TURBULENCE DATA SET WILL BE USED TO VALIDATE THE MODEL. THE GENERAL APPLICABILITY OF THE PROPOSED MODEL TO FUTURE WAKE TURBULENCE DATA INVOLVING MULTIPLE SCALE-SIZE EFFECTS WILL ALSO BE ASSESSED.

PHYSICAL SCIENCES INC PO BOX 3100 - RESEARCH PK ANDOVER, MA 01810 WILLIAM J MARINELLI TITLE: LASER-BASED DIAGNOSTIC FOR N <sub>2</sub> (X v) T 81 OFFICE: AFWL/PRC	AF	\$ 49,594
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WE PROPOSE TO DEVELOP TWO LASER-BASED TECHNIQUES TO MONITOR POPULATIONS OF HIGHLY VIBRATIONALLY EXCITED GROUND ELECTRONIC STATE N(2)(X,v>>0) IN A CHEMICAL LASER ENVIRONMENT. THE TECHNIQUES ARE NON-INTRUSIVE POINT DIAGNOSTICS WITH POTENTIAL DETECTION SENSITIVITIES AS LOW AS 10(12) MOLECULES cm<sup>-3</sup>. ONE TECHNIQUE INVOLVES THE USE OF MULTIPHOTON IONIZATION SPECTROSCOPY (MPI) TO IONIZE N<sub>2</sub>(X,v) WITH FOUR PHOTONS FROM A TUNABLE LASER USING THE a(1)Pig STATE AT THE TWO-PHOTON LEVEL. IONS FORMED IN THE GAS STREAM WILL BE COLLECTED USING BIASED ELECTRODES. THE SECOND TECHNIQUE EMPLOYS AN OPTICAL

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DOUBLE-RESONANCE METHOD TO EXCITE  $N(2)(X,v)$  TO  $N(2)(B,v)$  USING THE  $N(2)(A)$  STATE AS AN INTERMEDIATE. FLUORESCENCE FROM  $N(2)(B)$  WILL BE DETECTED AS A MEASURE OF  $N(2)(X,v)$ . THE TECHNIQUES WILL BE CALIBRATED USING THE He-METASTABLE PENNING IONIZATION TECHNIQUE IN CONJUNCTION WITH KINETIC MODELING. POTENTIAL INTERFERENCES FROM OTHER SPECIES POTENTIALLY PRESENT IN AN INTERHALOGEN TRANSFER LASER WILL BE EXPERIMENTALLY EVALUATED.  $N(2)(X,v)$  WILL BE PREPARED BY DISCHARGING  $N(2)/Ar$  MIXTURES IN A DISCHARGE FLOW REACTOR CURRENTLY IN OPERATION AT PSI. A TANDEM UV-VISIBLE Nd:YAG PUMPED DYE LASER SYSTEM WILL BE USED AS THE LASER PROBE SOURCE.

PHYSICAL SCIENCES INC  
PO BOX 3100 - RESEARCH PK  
ANDOVER, MA 01810  
DAVID I ROSEN

ARMY

\$ 49,938

TITLE:

OPTICAL DETECTION OF PAVEMENT ICING  
T 201 OFFICE: CRREL/COE

A METHOD FOR DETERMINING INCIPIENT ICE LAYER FORMATION ON PAVED SURFACES IS TO BE DEMONSTRATED. THE PROPOSED TECHNIQUE WILL RELY UPON THE ENHANCEMENT IN SPECULAR REFLECTANCE, I.E., "GLARE," THAT WILL OCCUR WHEN AN OVERLYING ICE LAYER FORMS ON A PAVED SURFACE. THE PROPOSED INVESTIGATIONS WILL ALSO EXPLORE HOW OVERLYING ICE LAYERS MODIFY THE BACKSCATTERED RADIATION OBSERVED OFF PAVEMENT SURFACES. THE CONCEPT CONSIDERED WOULD INVOLVE THE USE OF A LOW-POWER INFRARED LASER "BEACON" TO SCAN AT GLANCING ANGLES (~ 10 TO 15 DEG) SELECTED AREAS OF THE PAVED SURFACE AND AN ARRAY OF DETECTOR RECEIVERS TO MONITOR THE REFLECTED/SCATTERED RADIATION. THE CHARACTERISTICS OF THE OBSERVED OPTICAL SIGNAL WILL BE USED TO INDICATE THE PRESENCE OF PAVEMENT ICING.

PHYSICAL SCIENCES INC  
PO BOX 3100 - RESEARCH PK  
ANDOVER, MA 01810  
GERALD WILEMSKI

AF

\$ 48,983

TITLE:

COLLOIDAL DYNAMICS SIMULATIONS OF RHEOLOGY AND STABILITY OF  
CONCENTRATED FUEL SLURRIES  
T 3 OFFICE: AFOSR/XOT

WE PROPOSE TO USE LARGE SCALE COMPUTER SIMULATION TECHNIQUES TO

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>DEVELOP A THEORETICAL CAPABILITY FOR THE REALISTIC MODELING OF CONCENTRATED SLURRY RHEOLOGY AND STABILITY. THE IMMEDIATE APPLICATION IS THAT OF BORON/HYDROCARBON SLURRIES. WE WILL EXTEND BROWNIAN DYNAMICS TECHNIQUES TO INCLUDE THE EFFECTS OF SHEAR IN ORDER TO COMPUTE THE SLURRY VISCOSITY. CALCULATIONS PERFORMED WITHOUT SHEAR WILL BE USED TO DETERMINE DIFFUSION COEFFICIENTS AND STATIC PAIR DISTRIBUTION FUNCTIONS. WITH THIS INFORMATION, CLASSICAL COAGULATION THEORY WILL BE USED TO ESTIMATE SLURRY STABILITY. THE VALIDITY OF THESE COMPUTATIONAL METHODS WILL BE ESTABLISHED BY COMPARING CALCULATED RESULTS WITH EXPERIMENTAL DATA.</p>		

PHYSICAL SCIENCES INC PO BOX 3100 - RESEARCH PK ANDOVER, MA 01810 DR R DENNIS CREEHAN TITLE: LASER HARDENING OF EXTERNAL PROTECTION MATERIAL T 4 OFFICE: AM/SBIR	DNA	\$ 73,376
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A COMBINED THEORETICAL AND EXPERIMENTAL EFFORT IS PROPOSED FOR DEVELOPING A SUITABLE EPM MATERIAL WHICH PROVIDES SUBSTANTIAL PROTECTION AGAINST ANTICIPATED LASER THREATS. A NEW MATERIAL CONCEPT IS PROPOSED WHICH PROVIDES FOR DISSIPATION OF INCIDENT LASER ENERGY TO REFLECTION, ABLATION AND ANISOTROPIC THERMAL CONDUCTION. THIS MATERIAL IS EXPECTED TO INCREASE THE LASER INTERACTION TIME REQUIRED FOR STRUCTURAL FAILURE BY A FACTOR OF THREE OVER PRESENT CANDIDATE MATERIALS WITH NO SERIOUS WEIGHT PENALTY. THE CONCEPT IS BASED ON A MODIFICATION OF CURRENT ELASTOMER-TYPE MATERIALS SO AS TO RETAIN ALL THE DESIRABLE FEATURES OF SUCH MATERIALS WHILE PROVIDING THE ADDITIONAL PROTECTION AGAINST LASER IRRADIATION. THE PROPOSED MATERIAL WOULD MINIMIZE ANY ANTICIPATED PROBLEMS OF ATTACHMENT AND WOULD BE SUITABLE FOR RETROFITTING EXISTING EQUIPMENT.

PHYSICAL SCIENCES INC PO BOX 3100 - RESEARCH PK ANDOVER, MA 01810 WILLIAM J MARINELLI TITLE: TEMPORAL AND SPATIAL BEAM DIAGNOSTIC FOR HIGH POWER LASER SYSTEMS T 4 OFFICE: AM/SBIR	DNA	\$ 85,750
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WE PROPOSE TO DEVELOP A TECHNIQUE FOR RAPID TEMPORAL AND SPATIAL



FISCAL YEAR 1986

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AMOUNT

IMAGING OF HIGH POWER LASER BEAMS. THIS METHOD IS WINDOWLESS AND MAY BE EMPLOYED WHERE LASER INTENSITIES EXCEED THE DAMAGE THRESHOLDS FOR CONVENTIONAL CALORIMETRIC METHODS. THE DIAGNOSTIC UTILIZES THE TECHNIQUE OF OPTICAL-INFRARED DOUBLE RESONANCE TO OBSERVE BEAM INTENSITIES. IN THIS TECHNIQUE, THE OUTPUT OF A MWIR CHEMICAL LASER (DF) IS COMBINED WITH THE OUTPUT OF A VISIBLE/UV PROBE LASER TO PRODUCE OR MODULATE THE FLUORESCENCE OF A SIMPLE DIATOMIC MOLECULE SEEDED IN A GAS FLOW THROUGH WHICH THE LASER PROPAGATES. THE INTENSITY OF THE FLUORESCENCE IS LINEARLY PROPORTIONAL TO EACH OF THE LASER INTENSITIES. THE OVERLAP OF THE IR AND PROBE BEAMS DEFINES A CROSS SECTION OF THE IR BEAM, WHICH IS IMAGED ON TO A TWO-DIMENSIONAL INTENSIFIED ARRAY WITH 1 PERCENT SPATIAL RESOLUTION. TEMPORAL RESOLUTION IS DETERMINED BY THE LENGTH OF THE PROBE LASER PULSE (15 ns). AN ATMOSPHERIC PRESSURE LAMINAR FLOW JET WILL SEED THE MOLECULE TO BE EXCITED INTO THE GAS STREAM. PHASE I RESEARCH WILL SELECT FROM MANY POSSIBLE IMAGING MOLECULES AND PERFORM EXCITATION AND QUENCHING MEASUREMENTS TO DETERMINE OPTIMUM CANDIDATES. A RAMAN-SHIFTED PULSED DYE LASER WILL BE USED TO SIMULATE THE PEAK POWER OUTPUT OF A CW DF CHEMICAL LASER. A SECOND DYE LASER WILL BE USED AS THE PROBE LASER. POSSIBLE CANDIDATE MOLECULES INCLUDES THE HALOGENS, INTER-HALOGENS, AND NITRIC OXIDE.

PHYSICAL SCIENCES, INC.  
RESEARCH PARK, P.O. BOX 3100  
ANDOVER, MA 01810  
STEVEN J. DAVIS

SDIO

\$ 49,968

TITLE:

GROUP IV-A FLUORIDE LASERS

T 1 OFFICE:

PHYSICAL SCIENCES INC. PROPOSES TO CONSTRUCT AND DEMONSTRATE A NOVEL OPTICALLY PUMPED SiF LASER. SiF IS A MEMBER OF THE GROUP IV-A FLUORIDES WHICH HAVE BEEN PREVIOUSLY SHOWN TO HAVE NEARLY IDEAL ENERGY LEVEL STRUCTURES AND RADIATIVE LIFETIMES FOR DEVELOPMENT INTO HIGH ENERGY SHORT WAVELENGTH CHEMICAL LASERS. THERE ARE ALSO KNOWN TECHNIQUES FOR CHEMICALLY EXCITING THESE SPECIES. IT IS PREMATURE AT THIS TIME TO ATTEMPT A CHEMICAL LASER DEMONSTRATION. INSTEAD WE PROPOSE THE SIMPLER AND MORE COST EFFECTIVE APPROACH OF USING OPTICALLY PUMPED LASER TECHNIQUES TO DEMONSTRATE THAT THESE SYSTEMS ARE INDEED ATTRACTIVE LASER SYSTEMS. THE PROGRAM WILL RELY UPON A HIGH ENERGY DYE LASER TO OPTICALLY EXCITE AND LASE THE MOLECULE

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SIF. THE DATA OBTAINED FROM THIS STUDY WOULD BE ESSENTIAL FOR  
FUTURE DEVELOPMENT OF THESE PROMISING SYSTEMS.

PHYSICAL SCIENCES, INC.

SDIO

\$ 49,942

603 KING ST.

ALEXANDRIA, VA 22314

JACK A. MCKAY

TITLE:

NOVEL ULTRARAPID HEATING SYSTEM FOR HIGH TEMPERATURE MATERIALS  
PROPERTIES MEASUREMENT

T 8 OFFICE:

SEVERAL DETAILED MODELS EXIST WHICH ATTEMPT TO DESCRIBE THE RAPID  
PENETRATION OF AEROSPACE MATERIALS BY HIGH-POWER LASERS. THESE MO-  
DELS ARE NECESSARY FOR EXTRAPOLATION FROM MODEST LASERS AND LIMITED  
EXPERIMENTS TO FUTURE CAPABILITIES AND VARYING SCENARIOS. CRITICAL  
INPUTS TO THESE MODELS ARE THE THERMOPHYSICAL PROPERTIES OF MATERIALS  
SUDDENLY RAISED TO VERY HIGH TEMPERATURES, TEMPERATURES AT WHICH THE  
INTERESTING MATERIALS RAPIDLY DECOMPOSE. TRADITIONAL TECHNIQUES FOR  
THE MEASUREMENT OF THERMOPHYSICAL PROPERTIES INVOLVE SLOW HEATING,  
AND CANNOT POSSIBLY PROVIDE THE VALUES NEEDED FOR THE LASER PENETRA-  
TION MODELLING. WE PROPOSE THE DESIGN OF AN ELECTRON-BEAM ULTRARAPID  
HEATING DEVICE, CAPABLE OF INSTANTLY RAISING THE TEMPERATURE OF REIN-  
FORCED-COMPOSITE MATERIALS TO THOUSAND-DEGREE TEMPERATURES, IN DEPTH,  
THUS PERMITTING THE MEASUREMENT OF THE NECESSARY THERMOPHYSICAL PRO-  
PERTIES UNDER CONDITIONS APPROPRIATE TO THE LASER PENETRATION CASE.

PHYSICAL SCIENCES, INC.

SDIO

\$ 49,998

DASCOMB RESEARCH PK., P.O. BOX 3100

ANDOVER, MA 01810

GIRARD A. SIMONS

TITLE:

OPTIMIZATION OF TARGET MASS DISTRIBUTION FOR HARDENING AGAINST  
IMPULSIVE LOADING

T 7 OFFICE:

IMPACT LOADS FROM BOTH DIRECTED AND KINETIC ENERGY WEAPONS CAN IMPACT  
SUFFICIENTLY HIGH PRESSURES THAT TARGET SPALL OR FRAGMENTATION AND  
EITHER PENETRATION OR CRATER FORMATION OCCUR. POROUS TARGETS ARE  
SHOWN TO DISSIPATE THE DOMINANT FRACTION OF THE IMPACT ENERGY VIA

FISCAL YEAR 1986

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THERMAL ENERGY OF THE FRAGMENTS RATHER THAN VIA STRAIN ENERGY OF THE TARGET. HENCE, THE TARGET'S RESISTANCE TO IMPACT LOADS MAY BE OPTIMIZED BY TAILORING THE DISTRIBUTION OF POROSITY WITH DEPTH FROM THE IMPACT SURFACE. A POROUS SHOCK HUGONIOT AND THE ONE-DIMENSIONAL EQUATIONS OF FLUID MOTION WILL BE USED IN TANDEM WITH THE CALCULUS OF VARIATIONS TO DETERMINE THE OPTIMUM POROSITY DISTRIBUTION REQUIRED TO RESIST A GIVEN IMPULSIVE LOAD WITH THE MINIMUM TOTAL MASS. THE CONCEPTS DEVELOPED UNDER THE PROPOSED PROGRAM WILL BE APPLICABLE TO BOTH RETROFIT AND INITIAL DESIGN APPLICATIONS.

PHYSICON INC  
3225 BOB WALLACE AVE - STE I  
HUNTSVILLE, AL 35805  
DR MELVIN L PRICE  
TITLE:  
PULSED CONDUCTIVITY SENSOR  
T 6 OFFICE: AM/SBIR

DNA \$ 49,000

A NEWLY CONCEIVED SENSOR USES PULSED RF ENERGY CONDUCTED ALONG THE GROUND SURFACE TO IMMEDIATELY DETECT ANY OBJECT OR PERSON CROSSING A SELECTED AREA. THE SENSING ELEMENT IS THE GROUND ITSELF SINCE GROUND CONDUCTIVITY (RESISTANCE -1) CHANGES WHEN COMPRESSED BY THE WEIGHT OF AN OBJECT. USING ADVANCED SIGNAL PROCESSING TECHNIQUES, THE SENSOR TRANSLATES THE CHANGE IN GROUND CONDUCTIVITY INTO A WARNING SIGNAL THAT CAN BE CALIBRATED TO RECOGNIZE INDIVIDUALS, SMALL ANIMALS, VEHICLES, ETC. BY SETTING A THRESHOLD LEVEL THE SENSOR CAN BE USED AS AN INTRUSION DETECTOR TO PROTECT TACTICAL EQUIPMENT; A COMPLETE PERIMETER AROUND AN AREA CAN BE COVERED BY THE SENSOR SYSTEM USING SEVERAL SMALL, PORTABLE UNITS. THE SENSOR SYSTEM DOES NOT USE RADIATED FIELDS AND SHOULD BE TOTALLY TRANSPARENT TO DETECTOR BY HOSTILE FORCES. INSTALLATION, CHECKOUT, CALIBRATION AND OPERATION OF THE SENSOR SYSTEM CAN BE ACCOMPLISHED BY A SMALL TEAM (2-3 MEN) IN LESS THAN TWO HOURS FOR A PERIMETER OF A FEW KILOMETERS.

PHYSICON INC  
3225 BOB WALLACE AVE - STE I  
HUNTSVILLE, AL 35805  
DR MELVIN L PRICE  
TITLE:  
DIELECTRIC CONDUCTIVITY EFFECTS UNDER THE INFLUENCE OF IONIZING DOSE RATES  
T 147 OFFICE: NWSC

NAVY \$ 49,500

THE EFFECTS OF IONIZING RADIATION ON DIELECTRIC CONDUCTIVITY HAVE

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BEEN EXTENSIVELY STUDIED BY MANY RESEARCHERS. MUCH DATA EXIST IN THE LITERATURE FOR MATERIALS SUCH AS TEFLON, POLYETHYLENE, TANTALUM, ETC., WHICH ARE COMMONLY USED THROUGHOUT THE ELECTRONICS INDUSTRY. A NEED EXISTS TO COLLECT AND CHARACTERIZE THESE DATA IN ORDER TO DETERMINE WHAT ADDITIONAL MEASUREMENTS ARE REQUIRED TO COMPLETE THE SET. PREVIOUS EXPERIMENTS HAVE DEMONSTRATED A DEPENDENCE ON PHOTON ENERGY, TEMPERATURE, PRESSURE, BIAS, AND PREVIOUS HISTORY OF THE MATERIAL. IN ADDITION, EXPERIMENTAL TECHNIQUES CAN RESULT IN LARGE MEASUREMENT ERRORS DUE TO SPACECHARGE EFFECTS UNLESS CAREFULLY DESIGNED AND CONTROLLED TESTS ARE CONDUCTED. DURING THE PHASE I EFFORT, A CATALOG OF EXISTING DATA WILL BE PRODUCED BASED UPON A DETAILED LITERATURE SEARCH. THE DATA WILL BE CHARACTERIZED AND MISSING DATA IDENTIFIED. SINCE RADIATION-INDUCED DIELECTRIC CONDUCTIVITY CANNOT BE EASILY COMPUTED FROM FIRST PRINCIPLES, A NEW SERIES OF TESTS WILL BE DESIGNED THAT INCORPORATE TECHNIQUES TO ACCOUNT FOR SPACECHARGE EFFECTS AND PRELIMINARY HARDWARE WILL BE FABRICATED TO VALIDATE THE CONCEPTS. THEN, DURING PHASE II, AN EXTENSIVE SERIES OF TESTS WILL BE CONDUCTED TO COMPLETE THE DATA SET OF DIELECTRIC CONDUCTIVITY EFFECTS UNDER THE INFLUENCE OF IONIZING RADIATION.

PHYSICS MATHEMATICS & COMPUTERS INC	NAVY	\$ 49,007
128 STALLION CIR		
SOCORRO, NM 87801		
MATTHEW L PERINE		
TITLE:		
FAST SHORTLINE TRACING FOR SURVIVABILITY/VULNERABILITY CODES		
T 107	OFFICE: NSWC	

ALL SURVIVABILITY/VULNERABILITY COMPUTER CODES, INCLUDING THOSE FOR PROJECTILES, LASERS, AND RADIATION EFFECTS, INVOLVE TRACING SAMPLE PATHS (CALLED SHOTLINES) THROUGH COMPUTERIZED GEOMETRY MODELS. FOR COMPLEX EQUIPMENT, HUNDREDS OF THOUSANDS OF SHOTLINES ARE ANALYZED TO DETERMINE ITS VULNERABILITY TO VARIOUS WEAPON EFFECTS. THUS, THE SHOTLINE-TRACING COMPUTER CODES STRONGLY INFLUENCE THE ACCURACY AND THE COST OF COMPUTERIZED S/V ANALYSES. THE OBJECTIVE OF THIS RESEARCH IS TO DEVELOP A VERY FAST SHOTLINE TRACING ALGORITHM FOR S/V CODES. THE PROPOSED ALGORITHM IS BASED ON A PARTICULAR DATA STRUCTURE AND A PREPROCESSING STEP THAT HAS BEEN SUCCESSFUL IN OTHER RELATED APPLICATIONS. THE PHASE I EFFORT WILL DEVELOP THE ALGORITHM TO A POINT WHERE IT CAN BE COMPARED TO OTHER EXISTING METHODS ON A SET OF EXAMPLE PROBLEMS.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
PHYSICS MATHEMATICS & COMPUTERS INC 128 STALLION CIR SOCORRO, NM 87810 MATTHEW L PERINI TITLE: COMPUTER GENERATED TARGET/WEAPON INTERACTION GRAPHICS T 256 OFFICE: BMO/MYSC	AF	\$ 49,070

THIS RESEARCH CONCERNS THE USE OF COMPUTER ANIMATION FOR SIMULATING WEAPON/TARGET INTERACTION PHENOMENA. SUCH PHENOMENA ARE VERY DYNAMIC BY NATURE, AND ARE THUS GOOD APPLICATIONS FOR COMPUTER ANIMATION. THE FIRST STEP IN COMPUTER ANIMATION IS TO GENERATE A SET OF STATIC IMAGES THAT INCORPORATE HIDDEN SURFACE REMOVAL, LIGHT SOURCES, SHADING, AND OTHER SOPHISTICATED COLOR GRAPHICS RENDERING TECHNIQUES. THESE IMAGES ARE THEN MOVED ONTO A RECORDING MEDIUM SUCH AS VIDEO-TAPES. THIS PROJECT WILL TAKE AN EXAMPLE WEAPON/TARGET COMBINATION THROUGH STEP ONE OF THE ANIMATION PROCESS. THE PRINCIPAL OBJECTIVE IS TO PRODUCE A TIME-PHASED SEQUENCE OF SOPHISTICATED COLOR GRAPHICS IMAGES THAT PORTRAY THE WEAPON/TARGET INTERACTION PROCESS.

PI INC PO BOX 442 REDONDO BEACH, CA 90277 DR TSUN-YEE YAN TITLE: SMART-MUX FOR DIGITAL MICROWAVE SYSTEMS T 28 OFFICE: AD/YIR	AF	\$ 49,800
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USING WORD-STUFFING TECHNIQUE, A SMART MUX CAN BE DEVELOPED TO ALLOW MULTIPLEXING OF TELEMETRY AND OTHER HIGH-SPEED DATA STREAMS (OVER 1.544 Mbps) FOR TRANSMISSION OVER DIGITAL MICROWAVE SYSTEMS UTILIZING TWO OR MORE T1 LINES AND/OR AT THE DS-2 LEVEL. INPUT DATA SEQUENCE IS FORMATTING INTO I-BIT CHANNEL WORD. CHANNEL WORD IS THEN TRANSMITTED ONCE IN EACH DATA FRAME. BY ADJUSTING THE WORD RATE, TOGETHER WITH WORD-STUFFING, THE MUX CAN OPERATE AT VARIABLE INPUT DATA RATES.

PLANNING SYSTEMS INC 7900 WESTPARK DR - STE 600 MCLEAN, VA 22102 DAVID JAARMSA TITLE: SIGNAL PROCESSING: BROADBAND CROSS-CORRELATION TECHNIQUE DEVELOPMENT T 40 OFFICE: SPAWAR	NAVY	\$ 49,767
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NARROWBAND SPECTRAL ANALYSIS IS AN IMPORTANT SIGNAL PROCESSING

FISCAL YEAR 1986

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APPROACH FOR THE DETECTION OF TARGETS/OBJECTS THAT MAY BE IMBEDDED IN VARIOUS TYPES OF NOISE BACKGROUNDS. HOWEVER, THE SPECTRA EMITTED BY MANY TARGETS/OBJECTS IS BROADBAND IN NATURE, AND REQUIRES A DIFFERENT SIGNAL PROCESSING APPROACH TO MAXIMIZE PROBABILITY OF DETECTION FOR A FIXED PROBABILITY OF FALSE ALARM. THE OBJECTIVE OF THIS STUDY IS TO DETECT/TRACK A TARGET WHICH EMITS FEW/NO DISCRETE TONALS, BUT DOES POSSESS SIGNIFICANT BROADBAND ENERGY. THE EMPHASIS IS ON DETECTING A TARGET WHERE THE OBSERVED SIGNAL CONTAINS AN UNKNOWN RANDOM PARAMETER, NAMELY DOPPLER; AND THE NOISE BACKGROUND IS ADDITIVE, WHITE AND GAUSSIAN. THE APPROACH PROPOSED IS BASED ON MAXIMIZING THE LIKELIHOOD FUNCTION.

PLANNING SYSTEMS INC 95 TRUMBULL ST - STE B/FOSS BLDG NEW LONDON, CT 06320 JAMES W FITZGERALD TITLE: THE MATCHED-IMPEDENCE HYPOTHESIS FOR COMPLIANT SURFACE CONTROL OF BOUNDARY LAYER TURBULENCE T 158 OFFICE: NAVSEA/NUSC	NAVY	\$ 50,000
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THE DOLPHIN, AS A SELF-PROPELLED UNDERWATER PLATFORM, IS CHARACTERIZED BY UNUSUALLY SMALL HYDRODYNAMIC DRAG, EXCEPTIONALLY LOW FLOW NOISE, AND MARKED DELAY OF THE ONSET OF BOUNDARY LAYER TURBULENCE. DOLPHINS, SWIMMING IN BIOLUMINESCENT OPEN OCEAN WATER AT SPEEDS UP TO ~10 KTS, FOR EXAMPLE, ARE VIRTUALLY FREE OF ANY BOUNDARY LAYER BIOLUMINESCENCE; WHEREAS, BY CONTRAST, DIVERS IN WET SUITS SHED COPIOUS SHEETS OF BRIGHT BIOLUMINESCENCE AT MUCH LOWER SPEEDS OF ~0.5 KTS. THE HYPOTHESIS WAS PUT FORTH BY FITZGERALD (1968) THAT THIS REMARKABLE BOUNDARY LAYER CONTROL IS ASSOCIATED WITH THE COMPLEX DYNAMIC MECHANICAL PROPERTIES OF THE DOLPHIN'S THICK (~1") COMPLIANT BLUBBER (NTO THE THIN DOLPHIN SKIN, RE KRAMER [1960]). THE SURFACE OF THE COMPLIANT MATERIAL WILL BE DEFORMED BY THE FLUCTUATING SURFACE FORCES OF THE TURBULENT BOUNDARY LAYER (TBL) IN SOME STATISTICAL FASHION DETERMINED BY THE SCALE AND INTENSITY OF THE TURBULENCE. SINCE THE COMPLIANT MATERIAL IS VISCOELASTIC, THIS FLUCTUATING DEFORMATION MUST RESULT IN SOME ABSORPTION OF ENERGY FROM THE TURBULENT FIELD, THUS REDUCING THE INTENSITY OF TURBULENCE (OR DELAYING ITS ONSET). IN TERMS OF CIRCUIT ANALOGIES, THE COMPLIANT VISCOELASTIC MATERIAL REPRESENTS A "LOAD" ON THE TBL "GENERATOR." IN ORDER TO MAXIMIZE THE TRANSFER OF ENERGY (POWER) FROM TBL GENERATOR TO THE

FISCAL YEAR 1986

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COMPLIANT SURFACE LOAD, THE LOAD IMPEDANCE SHOULD BE "MATCHED" TO THE IMPEDANCE OF THE GENERATOR; THAT IS, THE COMPLEX DRIVING-POINT SHEAR IMPEDANCE OF THE COMPLIANT SURFACE SHOULD BE THE COMPLEX CONJUGATE OF THE COMPLEX IMPEDANCE "LOOKING" INTO THE TBL.

PLANNING SYSTEMS INC	NAVY	\$ 49,962
7900 WESTPARK DR - STE 600		
MCLEAN, VA 22102		
DR MARSHALL R BRADLEY		
TITLE:		
PRESSURE WAVE GENERATION TECHNIQUES: A FEASIBILITY STUDY		
T 159	OFFICE: NAVSEA/NCSC	

THE LACK OF SHIP DEPLOYABLE AND OPERATIONALLY USEFUL MINESWEEPING EQUIPMENT TO COUNTER THE PRESSURE MINE THREAT REMAINS A CRITICAL DEFICIENCY. THIS PROPOSED RESEARCH IS TO INVESTIGATE NEW TECHNIQUES, NEW APPLICATIONS, AND USE OF NEW TECHNOLOGY/MATERIALS FOR DEVELOPMENT OF FEASIBLE NEW APPROACHES TO SOLVE THE PRESSURE MINESWEEPING PROBLEM. TWO NEW PRESSURE MINE COUNTERMEASURE TECHNIQUES ARE TO BE INVESTIGATED FOR FEASIBILITY. COMPUTATIONAL FLUID MECHANICS TECHNIQUES WILL BE USED TO ESTABLISH CAPABILITY TO GENERATE PRESSURE SIGNATURES AND TO INVESTIGATE TOWING AND STABILITY PROBLEMS. BOTH TECHNIQUES WILL BE DEVELOPED TO THE POINT OF TWO TO THREE ENGINEERING IMPLEMENTATION OPTIONS EACH OF WHICH WILL THEN BE ASSESSED TO DETERMINE THE MOST OPERATIONALLY SUITABLE SYSTEM. RECOMMENDATIONS FOR FURTHER DEVELOPMENT OF THESE CONCEPTS, IF WARRANTED, WILL BE IN THE FORM OF SCALE OR FULL MODEL TEST CONCEPTS FOR DEMONSTRATING A PRESSURE MINE SWEEP CAPABILITY. AN EVALUATION MODEL WILL BE DEVELOPED WHICH ASSESSES CANDIDATE PRESSURE MINESWEEPING CONCEPTS FROM AN OPERATIONAL STANDPOINT, AND WILL BE USED TO EVALUATE CANDIDATE SYSTEMS. THIS EVALUATION TOOL WILL INCLUDE APPROPRIATE PARAMETERS SUCH AS PRESSURE FIELD EVALUATION, TOWING TENSIONS, VESSEL POWER REQUIREMENTS, DEPLOYABILITY/RECOVERABILITY, AND OTHER ITEMS RELATED TO THE OPERATIONAL SUITABILITY OF CANDIDATE SYSTEMS.

PLASMA PHYSICS CORP	NAVY	\$ 49,064
PO BOX 548		
LOCUST VALLEY, NY 11560		
DR HERBERT MALAMUD		
TITLE:		
ANOMOLOUS DIELECTRIC CONDUCTIVITY EFFECT AND ITS RELATION TO RADIATION HARDENING		
T 147	OFFICE: NWSC	

IT IS WELL KNOWN THAT THE RESISTIVITY OF DIELECTRICS DROPS PRE-

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AMOUNT

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CIPITOUSLY UNDER HIGH ENERGY RADIATION. THIS IS CLEARLY AN IMPORTANT PROBLEM FOR ELECTRONIC EQUIPMENT UNDER RADIATION BOMBARDMENT IN CASE OF NUCLEAR ATTACK, IN THE SPACE PROGRAM, AND IN NUCLEAR POWER IN STALLATIONS, WHETHER FIXED POWER OR MOBILE (SHIP) POWER PLANTS. THE PRESENT PROPOSER FOUND THAT AFTER THIS INITIAL RESISTIVITY DROP, FURTHER IRRADIATION CAUSED A MARKED RISE IN RESISTIVITY OF MANY DIELECTRICS. WHEN REMOVED FROM RADIATION, THE RESISTANCE RETURNED TO ITS PRE-IRRADIATED VALUE. THIS EFFECT ON THE INDUCED RESISTIVITY SUGGESTS THE POSSIBILITY OF PRE-IRRADIATING DIELECTRICS TO THE POINT WHERE THEY PASS THE RESISTIVITY LOW POINT AND HAVE CLIMBED UP THE RISING SIDE OF THE RESISTIVITY-RADIATION CURVE. WE PROPOSE TO INVESTIGATE THIS RADIATION HARDENING EFFECT OF DIELECTRICS IN ELECTRONIC COMPONENTS ALONG WITH CHEMICAL ADDITIVES IN ORDER TO REDUCE THE MOBILITY OR LIFE TIME OF THE CHARGE CARRIERS INDUCED BY THE RADIATION.

POLLARD RD INC  
2361 JEFFERSON DAVID HWY - STE 708  
ARLINGTON, VA 22202  
THEODORE BIALLY

AF

\$ 73,715

## TITLE:

SIGNAL PROCESSING TECHNIQUES FOR CONSTANT FALSE ALARM RATE  
DETECTORS IN A DENSE TARGET ENVIRONMENT

T 225

OFFICE: BMO/MYSC

IT IS PROPOSED TO DEVELOP AND EVALUATE A NEW CLASS OF CONSTANT FALSE ALARM RATE (CFAR) ALGORITHMS FOR USE IN DENSE TARGET ENVIRONMENTS, BASED ON ADVANCED MULTIDIMENSIONAL DIGITAL SIGNAL PROCESSING METHODS. EXISTING CFAR TECHNIQUES EMPLOY A VARIETY OF PRIMITIVE ONE- AND TWO-DIMENSIONAL DIGITAL FILTERS, BOTH LINEAR AND NON-LINEAR. MORE POWERFUL FILTERING AND PROCESSING METHODS HAVE EMERGED FROM RECENT RESEARCH EFFORTS IN MULTIDIMENSIONAL SIGNAL PROCESSING. THE PROPOSED WORK IS DIRECTED AT ADAPTING AND APPLYING THESE NEW METHODS TO THE DENSE-TARGET CFAR PROBLEM. THE BASIC APPROACH WILL BE TO TREAT RANGE-DOPPLER RADAR MAPS AND ANGLE-ANGLE IR MAPS AS IMAGES THAT CAN BE PROCESSED BY A VARIETY OF MULTIDIMENSIONAL SIGNAL ENHANCEMENT ALGORITHMS IN ORDER TO ELIMINATE STATISTICAL ANOMALIES FROM THE DATA. THRESHOLDS FORMED FROM THE PROCESSED IMAGE WILL BE FREE OF TARGET CONTAMINATION AND, WHEN APPLIED TO THE ORIGINAL DATA, SHOULD YIELD GOOD CFAR PERFORMANCE REGARDLESS OF TARGET DENSITY. THE COMPUTATION-INTENSIVE NATURE OF MULTIDIMENSIONAL SIGNAL PROCESSING ALGORITHMS



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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IMPLIES THAT SMALL, LIGHTWEIGHT HARDWARE IMPLEMENTATIONS WILL REQUIRE THE USE OF VHSIC DEVICES AND/OR CUSTOM VLSI CHIPS. INCLUDED IN THE PROPOSAL IS A HIGH LEVEL ARCHITECTURAL DESIGN TASK AIMED AT ASSESSING THE COMPATIBILITY OF THESE DEVICES WITH ADVANCED CFAR REQUIREMENTS.

POLLARD ROAD INC  
2361 JEFFERSON DAVIS HWY- STE 708  
ARLINGTON, VA 22202  
ROBERT K SCHNEIDER  
TITLE:  
CONICALLY CONFORMAL ARRAY ANALYSIS  
T 259 OFFICE: BMO/MYSC

AF \$ 59,762

A COMPUTATIONAL TOOL FOR THE DESIGN AND ANALYSIS OF CONICALLY CONFORMAL ARRAY ANTENNAS IS TO BE DEVELOPED. THIS TOOL WILL BE BASED ON TWO ANALYTIC APPROACHES: (1) A HIGH-FREQUENCY ASYMPTOTIC (RAY) METHOD AND (2) AN EIGENEXCITATION (MODAL) TECHNIQUE. THE EFFECTS OF MUTUAL COUPLING, ARRAY EDGE CONTRIBUTIONS AND TIP DIFFRACTION WILL BE INCLUDED. THE RESULTING COMPUTER CODE WILL BE USED TO DESIGN A BASELINE ARRAY FOR WHICH IDENTIFIED PHASE II PARAMETRIC VARIATIONS CAN BE ANALYZED AND EMPIRICAL VALIDATIONS PERFORMED. AN INITIAL VALIDATION OF THIS BASELINE DESIGN AND ITS PREDICTED PERFORMANCE WILL BE ACCOMPLISHED USING AN EXISTING MOMENT METHOD CODE.

POLLARD ROAD INC  
2361 JEFFERSON DAVIS HWY - STE 708  
ARLINGTON, VA 22202  
VERNE L LYNN  
TITLE:  
MILLIMETER WAVE INSTRUMENTATION RADAR  
T 169 OFFICE: TECOM/WSMR

ARMY \$ 48,317

RECENT ADVANCES IN MILLIMETER-WAVE TECHNOLOGY NOW PERMIT DEVELOPMENT OF AN AGILE BEAM HIGH RESOLUTION TRACKING RADAR WHICH OFFERS EXCELLENT PERFORMANCE WHILE REMAINING HIGHLY MOBILE. SUCH AN INSTRUMENT CAN OBSERVE MISSILES AND SUBMUNITIONS NEAR THE GROUND AND PROVIDE (1) GREATLY IMPROVED UNDERSTANDING OF THE DETAILED MUNITION TRAJECTORY, DISPENSING, DISPERSION AND IMPACT DISTRIBUTIONS; (2) VERY RAPID AUTOMATED PROCESSING OF THESE DATA; AND (3) AUTOMATED CALIBRATION TO ASSURE IMPROVED PRECISION AND RELIABILITY. IN ADDITION,

FISCAL YEAR 1986

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BECAUSE THIS WILL BE A FLEXIBLE AND VERSATILE SYSTEM, IT WILL ALSO BE CAPABLE OF PROVIDING RAPID AND AUTOMATIC ARTILLERY IMPACT DETERMINATION, SCORING AND DISPERSION STATISTICS AND CAN READILY BE ADAPTED TO DETERMINE MISS DISTANCES AND PATTERNS FOR ANTI-AIRCRAFT GUN FIRINGS.

POTOMAC SYNERGETICS INC (PSI)

ARMY

\$ 49,188

PO BOX 953

MCLEAN, VA 22101

V J CORCORAN

TITLE:

TUNABLE LASER MATERIALS DEVELOPMENT FOR THE NEAR INFRARED

T 66 OFFICE: CECOM/AMSEL

PSI PROPOSES TO PURCHASE SPECTROSCOPIC SAMPLES OF MATERIALS DOPED WITH TRANSITION METALS TO STUDY AS POSSIBLE ROOM TEMPERATURE LASER MATERIALS FOR THE NEAR INFRARED. INTERFEROMETER PATTERNS, ABSORPTION SPECTRA, EMISSION (FLUORESCENCE) SPECTRA AND EXCITATION SPECTRA WILL BE OBTAINED. FLUORESCENCE LIFETIMES WILL ALSO BE OBTAINED. CALCULATIONS OF QUANTUM EFFICIENCIES, BRANCHING RATIOS AND STIMULATED EMISSION CROSS SECTIONS WILL BE CALCULATED. DELETERIOUS COMPETING PROCESSES SUCH AS EXCITED STATE ABSORPTION WILL BE CONSIDERED IN EVALUATING THE DATA.

POWER SPECTRA INC

NAVY

\$ 49,718

42660 CHRISTY ST

FREMONT, CA 94538

LARRY RAGLE

TITLE:

OPTICALLY ACTIVATED AVALANCHE MODE BULK SEMICONDUCTOR SWITCH

T 3 OFFICE: ONR

THIS PROPOSAL DESCRIBES AN OPTICALLY ACTIVATED GALLIUM ARSENIDE BULK SEMICONDUCTOR SWITCH OPERATED IN THE AVALANCHE MODE. TWO 120 WATT FIBER-OPTICALLY COUPLED GALLIUM ARSENIDE LASER ARRAYS DRIVE THE SWITCH. THE DEVICE IS BIASED TO A SUBSTANTIAL FRACTION OF THE VOLTAGE REQUIRED FOR SELF-BREAKDOWN. THE LASERS CREATE SUFFICIENT ELECTRON-HOLE PAIRS IN THE SEMI-INSULATING GALLIUM ARSENIDE, SO THAT AVALANCHE BREAKDOWN OCCURS. THE GALLIUM ARSENIDE IS THUS SWITCHED FROM A SEMI-INSULATING STATE TO HIGH CONDUCTION. THE AVALANCHE GAIN MECHANISM

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>GREATLY REDUCES THE LASER DRIVE REQUIREMENT OVER THAT REQUIRED BY LINWAR MODE OPTICALLY ACTIVATED DEVICES. THIS AVALANCHE MODE OF OPERATION OF A BULK SEMICONDUCTOR SWITCH PRODUCES SUBNANOSECOND PULSES. IT IS MORE COMPACT AND MORE ECONOMICAL THAN DEVICES OPERATED IN THE LINEAR MODE WITH EITHER Nd:YAG OR LARGE 700 WATT LASER DIODE ARRAYS. THE DEVICE DESCRIBED WILL PRODUCE 100 PICOSECOND, 1 KV PULSES WITH LOW JITTER AND IS CAPABLE OF OPERATING AT A PULSE REPETITION FREQUENCY OF 0.5 KILOHERTZ.</p>		

PREDICTION SYSTEMS INC 200 ATLANTIC AVE MANASQUAN, NJ 08736 WILLIAM C CAVE TITLE: INTERACTIVE SYMBOLIC SIMULATOR FOR RAPID ANALYSIS COMMUNICATIONS SYSTEMS T 48 OFFICE: CECOM/AMSEL	ARMY	\$ 50,000
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PREDICTION SYSTEMS, INC. (PSI) HAS INTRODUCED THE CONCEPT OF SYMBOLIC MODELING WITH ITS GENERAL SIMULATION SYSTEM (GSS) TO PROVIDE COMMUNICATIONS SYSTEMS ENGINEERS WITH THE ABILITY TO RAPIDLY BUILD COMPLEX MODELS, RUN SIMULATIONS, AND GET RESULTS VERY QUICKLY. IN THIS PROJECT, PSI IS PROPOSING TO EXTEND THIS CONCEPT TO PROVIDE INTERACTIVE SYMBOLIC SIMULATION, A CONCEPT WHICH WILL ALLOW COMMUNICATIONS ENGINEERS TO INTERACT WITH THE SIMULATION, MANIPULATING SYMBOLIC MODELS AND GETTING SYMBOLIC MEASURES OF PERFORMANCE DIRECTLY, IN REAL TIME. TO SUPPORT THE KINDS OF ANALYSES REQUIRED FOR DESIGN, TEST, AND EVALUATION OF ARMY GROUND COMMUNICATIONS, THE ANALYST MUST BE ABLE TO PAN AND ZOOM OVER MILITARY MAPS. TO ACCOMPLISH THIS, PSI IS PROPOSING TO INTEGRATE ITS HIERARCHICAL TERRAIN DATA BASE, WHICH SUPPORTS FAST PROPAGATION PREDICTIONS, WITH THE LARGEST GRAPHICS TECHNOLOGY USING THE GSS RUN TIME GRAPHICS SUPPORT OPTION. IN PHASE I, PSI WILL DEMONSTRATE HOW INTERACTIVE SYMBOLIC SIMULATION, SUPPORTED BY DETAILED ENGINEERING MODELS, CAN BE USED TO OBTAIN COMMUNICATIONS SYSTEM PERFORMANCE MEASURES IN REAL TIME. THE OBJECTIVE IS TO SHOW HOW COMPLEX ANALYSES CAN BE PERFORMED VERY QUICKLY WITH A MINIMUM OF SCARCE ENGINEERING RESOURCES.

PRESEARCH INC 8500 EXECUTIVE PARK AVE FAIRFAX, VA 22031 DR ROBERT L SAX TITLE: MAN-MACHINE INTERFACE (MMI) CONCEPT FOR THE REPRESENTATION OF TRANSIENT ACOUSTIC DISTURBANCES (EVENTS) T 10 OFFICE: ONR	NAVY	\$ 49,981
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PRESEARCH INCORPORATED PROPOSES TO RESEARCH AND DESIGN A MAN-MACHINE-

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>INTERFACE (MMI) CONCEPT FOR A TRANSIENT ACOUSTIC DETECTION MONITOR (TADM). THIS RESEARCH WILL EVALUATE PERFORMANCE MEASUREMENT, ACOUSTIC SYSTEM IMPLEMENTATION EXPERIENCE, DECISION-MAKING PROTOCOLS FOR CLASSIFYING TRANSIENT ACOUSTIC EVENTS, AND STATE-OF-THE-ART ADVANCES IN SIGNAL PROCESSING ALGORITHMS. THE MMI DESIGN WILL PROVIDE VISUAL AND AUDITORY DISPLAYS AND CONTROLS OF TRANSIENT ACOUSTIC DISTURBANCES. THESE DISPLAYS WILL BE A HUMAN-ENGINEERED REPRESENTATION AIMED AT ENHANCING OPERATOR PERFORMANCE. THIS RESEARCH EFFORT WILL COMBINE PRESEARCH'S HUMAN PERFORMANCE ENGINEERING EXPERTISE WITH OUR ON-GOING INDEPENDENT RESEARCH AND DEVELOPMENT (IR&amp;D) IN ACOUSTIC SIGNAL PROCESSING.</p>		

PRINCETON COMBUSTION RESEARCH LABS INC 475 U.S. HIGHWAY ONE MONMOUTH JUNCTION, NJ 08852 DR NEALE A MESSINA TITLE: LOW SENSITIVITY COMPOSITE PROPELLANT EMULSIONS FOR USE AS A LIQUID GUN PROPELLANT T 25	ARMY	\$ 52,311
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OFFICE: ARDC/SMCAR

THE TECHNICAL OBJECTIVES OF THE PROJECT ARE TO IDENTIFY CANDIDATE LIQUID GUN PROPELLANTS THAT CAN BE FORMULATED AND PREPARED AS STABLE EMULSIONS. VARIOUS FUELS COMBINED WITH HAN AS THE OXIDIZER AND AN EMULSIFYING AGENT WILL BE EXAMINED FOR STABILITY AND PERMANANCE. PHYSICAL PROPERTIES, IGNITION SENSITIVITY AND CLOSED CHAMBER BALLISTIC PERFORMANCE WILL BE EXPERIMENTALLY DETERMINED. THE EFFORT WILL BE CONDUCTED IN HREE PARTS, THE FIRST BEING A LITERATURE SURVEY OF PROPELLANTS AND EMULSIFYING AGENTS. IN THE SECOND PART OF THE STUDY, THE BLAKE CODE WILL BE UTILIZED TO DETERMINE THEORETICAL BALLISTIC PERFORMANCE. WORK COMPLETED BY PCRL INDICATES THAT AT LEAST ONE HYDROCARBON IS THEORETICALLY CAPABLE OF PERFORMANCE COMPARABLE TO LGP 1845 IN TERMS OF IMPETUS AND FLAM TEMPERATURE. THE THIRD PART OF THE STUDY WILL BE EXPERIMENTAL, DURING WHICH CANDIDATE EMULSIONS WILL BE PREPARED AND EVALUATED. CLOSED BOMB, COMPRESSION IGNITION SENSITIVITY, AND DROP WEIGHT TESTS WILL DETERMINE SOME THERMOCHEMICAL PROPERTIES AND PROVIDE A PRELIMINARY ASSESSMENT OF HAZARDOUSNESS.

PRINCETON SCIENTIFIC ENTERPRISES INC 1108 KINGSTON RD PRINCETON, NJ 08540 DAVID W BLAIR TITLE: SURVEY OF CURRENT TECHNOLOGY FOR NOx ABATEMENT T 31	ARMY	\$ 50,000
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OFFICE: ARDC/SMCAR

THIS IS A PROPOSAL TO CONDUCT A COMPREHENSIVE SURVEY OF THE MARKET

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>FOR NOx ABATEMENT TECHNOLOGIES, SOURCES OF NOx EMISSIONS, AVAILABLE ABATEMENT TECHNOLOGIES, AND THE SCIENTIFIC UNDERSTANDING OF NOx GENERATION AND ABATEMENT. THIS SURVEY WILL INCLUDE EXTENSIVE COMPUTERIZED SEARCHES OF THE DOMESTIC, FOREIGN, PATENT, AND U.S. GOVERNMENT REPORTS LITERATURE, AS WELL AS DIRECT COMMUNICATIONS WITH TECHNOLOGY PROVIDERS AND USERS. THE WORK WILL THEN MATCH ABATEMENT TECHNOLOGIES TO SOURCES AND DESIGN COST/BENEFIT ANALYSES FOR THE MATCHUPS. IT WILL SHOW WHERE CURRENT TECHNOLOGIES CAN BE IMPROVED WITH AVAILABLE SCIENTIFIC KNOWLEDGE, AND IT WILL IDENTIFY DEFICIENCIES IN THE SCIENTIFIC DATA BASE. THE MATCHUP AND SYSTEM OF ANALYSIS WILL BE ORGANIZED AS A DATA BASE ON A MICROCOMPUTER FOR CONVENIENT USE, EDITING, AND UPDATING. A PILOT TASK WILL BE IDENTIFIED IN COOPERATION WITH THE ARMY, AND A COST ANALYSIS AND INVESTIGATION PROTOCOL WILL BE ESTABLISHED FOR THE PILOT TASK.</p>		

PRINCETON SCIENTIFIC INSTRUMENTS INC  
306 ALEXANDER ST  
PRINCETON, NJ 08540  
A DANFORTH COPE

ARMY

\$ 49,474

## TITLE:

ANGULAR MOTION SENSOR FOR CANNON MUZZLE  
T 154 OFFICE: LABCOM/BRL

THE PROPOSED ANGULAR MOTION SENSOR SYSTEM IS BASED ON DYNAMICALLY MEASURING THE POSITION OF A LIGHT BEAM REFLECTED BY A MIRROR MOUNTED ON THE CANNON MUZZLE TO DETERMINE PITCH AND YAW MOTION AND MEASURING THE POSITION OF TWO SMALL LIGHT SOURCES MOUNTED ON OPPOSITE SIDES OF THE MUZZLE TO DETERMINE ROLL. THE PROPOSED SYSTEM LENDS ITSELF TO BEING RUGGEDIZED FOR USE AS A CONTINUOUS MUZZLE REFERENCE SYSTEM IN FIELDED EQUIPMENT. THE TWO LIGHT SOURCES LOCATED ON THE MUZZLE CAN BE SOLID STATE LIGHT EMITTING DIODES (LED) OR THE ENDS OF FIBER OPTIC STRANDS RUN DOWN THE CANNON BARREL PERIPHERY TO THE MUZZLE. THE ELECTRO-OPTIC IMAGE SENSOR IS A TWO DIMENSIONAL SILICON POSITION SENSOR THAT VIEWS THE MIRROR AND LIGHT SOURCES THROUGH A CATADIOPTIC TYPE TELESCOPIC LENS WHICH CAN ALSO BE MADE QUITE RUGGED. THE LIGHT SOURCES ARE MODULATED TO ALLOW DISCRIMINATION FROM EACH OTHER AND THE AMBIENT BACKGROUND LIGHT. BACKGROUND WILL BE FURTHER REDUCED BY NARROW BAND OPTICAL FILTERS CENTERED ON THE EMISSION WAVELENGTH OF THE LIGHT EMITTING DIODES. THE PHASE I EFFORT WILL BE DEVOTED TO DESIGN AND FABRICATION OF A PROTOTYPE SYSTEM THAT WILL BE TESTED IN THE LABORATORY, AND THEN MADE AVAILABLE FOR FIELD TESTS.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
PRODUCT PLANNING INC 524 BUSSE HWY PARK RIDGE, IL 60068 BERNARD BISHOP TITLE: CONSTANT TENSION SPOOLING DEVICE T 185 OFFICE: NSRDC	NAVY	\$ 49,770

THERE IS AN ABSOLUTE NEED TO FIND BETTER METHODS FOR SPOOL TO SYSTEM TRANSFER OF CABLE, ROPE AND ARRAYS. PRESENT METHODS USED ARE MANUAL OR MAKESHIFT. THIS IS PARTIALLY DUE TO THE LARGE VARIETY OF FIELD CIRCUMSTANCES AND THE STATE OF THE ART DESIGN OF LOW SPEED, HIGH TORQUE SYSTEMS. THE PROPOSED SYSTEM STUDY WILL FILL THE NEEDS OF MOST CABLE TRANSFER REQUIREMENTS. IT IS AN AUTOMATIC SYSTEM THAT SENSES AND CONTROLS MECHANICALLY, THEREBY ELIMINATING UNCONTROLLABLES SUCH AS TEMPERATURE. IT WILL ELIMINATE THE NEED OF AN EXPERIENCED OR SKILLED OPERATOR BUT OFFERS THE INDICATION NECESSARY FOR HIS CONTROL DECISION. IT WILL SOLVE MANY OF THE DOCK LOADING AND ALIGNMENT PROBLEMS AND ACCOMODATES A WIDE RANGE OF SHIPPING SPOOL SIZES. MOST IMPORTANTLY, IT WILL MAINTAIN A BALANCE OF THE SPEED/TORQUE RATIO FOR DIAMETRAL CHANGES INCLUDING LEVEL WIND ERROR. PHASE I INVESTIGATION IS TO DEFINE SYSTEM CONFIGURATION AND TEST/EVALUATE THE SENSOR FEED-BACK CONTROL SYSTEM FOR INERTIAL RESPONSE. THIS WILL BE A REALTIME ENGINEERED HARDWARE MODEL TO QUALIFY INERTIAL REACTION TIME.

PROGRAMMING ENVIRONMENTS INC 4043 STATE HWY 33 TINTON FALLS, NJ 07753 ROBERT POSTON TITLE: THE FEASIBILITY OF T: A TOOL TO AUTOMATICALLY GENERATE SOFTWARE TEST CASES T 76 OFFICE: CECOM/AMSEL	ARMY	\$ 48,700
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THE LACK OF HIGH-RELIABILITY SOFTWARE IS A MAJOR PROBLEM IN THE MILITARY AND COMMERCIAL COMMUNITIES TODAY. TRADITIONAL V&V TECHNIQUES IMPROVE SOFTWARE RELIABILITY BY HELPING TO FIND ERRORS EARLY IN SOFTWARE DEVELOPMENT, BUT WE NEED TO GO BEYOND THESE TECHNIQUES TO FIND A WAY TO PREVENT ERRORS FROM OCCURRING IN THE FIRST PLACE.

FISCAL YEAR 1986

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PEI HAS BEEN USING ERROR PREVENTION CONCEPTS IN A FRONT END TESTING APPROACH. WE HAVE DEVELOPED A SOFTWARE TESTING METHODOLOGY AND A NEW TOOL CALLED "T" WHICH GENERATES TEST CASES BEFORE THE DEVELOPER BEGINS DESIGN. THE METHODOLOGY AND THE TOOL WORK ON SMALL COLLECTIONS OF CODE BUT ARE NOT EFFECTIVE ON LARGE SOFTWARE SYSTEMS TODAY. WE PROPOSE A SOLUTION TO THE COMBINATORICS OR EXHAUSTIVE TESTING PROBLEM WHICH HAS DELAYED THE USE OF THESE INNOVATIONS ON PROJECTS PRODUCING MORE THAN A FEW THOUSAND LINES OF CODE.

PROGRESSIVE LEARNING SYSTEMS  
11325 - SEVEN LOCKS RD - STE 226  
POTOMAC, MD 20854  
D SULLIVAN/DR L NAWROCKI

NAVY

\$ 49,377

TITLE:

INTELLIGENT AIDS FOR ISD TRAINING ANALYSIS  
T 166 OFFICE: NAVSEA/NTEC

THIS RESEARCH PROPOSES TO DESIGN AN EXPERT SYSTEM FOR PHASE I OF THE ISD MODEL (FRONT-END ANALYSIS). THE RESULT WOULD BE A DESIGN ARCHITECTURE FOR INTELLIGENT SOFTWARE TO PROVIDE RELIABLE, QUANTIFIABLE RESULTS OF FRONT-END ANALYSIS IN A TIMELY FASHION. THE ISD MODEL IS SELECTED BECAUSE OF ITS RIGOROUS SYSTEMS APPROACH TO TRAINING DEVELOPMENT AND BECAUSE OF ITS USE, IN VARIOUS FORMS, BY THE MILITARY. THE APPROACH WILL BE TO ANALYZE AND MODIFY EXISTING JOB AND AUTHOR AIDS, AND BY EXAMINATION OF EXPERT BEHAVIOR, DEVELOP A KNOWLEDGE REPRESENTATION AS AN ADAPTIVE DATA BASE. ANALYZING EXPERT JOB/TASK ANALYSIS ACTIVITIES WILL ALSO PROVIDE A PRELIMINARY SET OF PRODUCTION OR CLASSIFICATION ROLES, AS APPROPRIATE. THE END PRODUCT OF THE PROPOSED RESEARCH IS A DETERMINATION OF FEASIBILITY AND AN INITIAL DESIGN ARCHITECTURE UPON WHICH TO BASE FUTURE SOFTWARE DEVELOPMENT TESTING.

PROMETHEUS INC  
103 MANSFIELD ST  
SHARON, MA 02067  
JAMES S BYRNES

AF

\$ 47,915

TITLE:

NULL STEERING APPLICATIONS OF POLYNOMIALS WITH UNIMODULAR COEFFICIENTS  
T 12 OFFICE: AFOSR/XOT

THE BASIC MATHEMATICAL QUESTION TO CONSIDER IN ELECTRONIC BEAM

FISCAL YEAR 1986

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STEERING, WITH A DISCRETE ARRAY CONSISTING OF OMNIDIRECTIONAL ELEMENTS SPACED AT EQUAL INCREMENTS ALONG A STRAIGHT LINE IS HOW COEFFICIENTS OF A POLYNOMIAL WAY BE CHOSEN, IN A ROBUST YET COMPUTATIONALLY EFFICIENT MANNER, SO AS TO ARRIVE AT A DESIRED BEAM PATTERN. IN MANY APPLICATIONS, PARTICULARLY WITH ACTIVE ARRAYS, IT IS OFTEN ADVANTAGEOUS, OR EVEN NECESSARY, FOR THESE SHADING COEFFICIENTS TO ALL HAVE THE SAME MODULUS. THE PRIMARY OBJECTIVE OF THE PHASE I RESEARCH IS TO EMPLOY THE SEMINAL KNOWLEDGE OF THE PROMETHEUS PERSONNE, IN THE FIELD OF POLYNOMIALS WITH UNIMODULAR COEFFICIENTS, TO FURTHER THE STATE OF THE ART IN ADAPTIVE ARRAY PROCESSING AND NULL STEERING.

PROPULSION DYNAMICS CORP.

SDIO

\$ 49,041

42 CHERRY LANE

HUNTINGTON, NY 11743

VITO AGOSTA, PHD

TITLE:

THERMOCHEMICALLY SEEDED GAS BLAST PLASMA FOR SUSTAINED SWITCHING OPERATION

T

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OFFICE:

AIR BLAST SWITCHES HAVE BEEN THE "WORKHORSES" FOR SWITCHING LARGE MAGNITUDES OF POWER. AT THE PRESENT TIME THERE EXIST DEMANDS TO TRANSFER LARGE QUANTITIES OF POWER FOR APPLICATIONS IN SPACE POWER AND POWER CONDITIONING. THESE INCLUDE WEAPONS, SENSING AND COMMUNICATIONS SYSTEMS, WHEREIN CONCEPTS, PROCESSES AND METHODS ARE BEING SOUGHT FOR A WIDE SPECTRUM OF POWER AND THERMAL MANAGEMENT. TWO OF THE MAIN ATTRIBUTES OF THESE SWITCHING SYSTEMS MUST BE RELIABILITY AND MAINTAINABILITY. OUR NOVEL APPROACH TO ADDRESSING THESE NEEDS IS TO MODIFY THE AIR BLAST CONCEPTS THAT ARE USED TO DESIGN THESE HIGH ENERGY TRANSFER SWITCHES. WE WILL DO THIS BY (1) TAILORING THE GAS THERMODYNAMICALLY TO MEET THE ELECTRICAL AND THERMAL CHARACTERISTICS OF THE SWITCH (2) TAILORING THE GAS FLOW PASSAGES AERODYNAMICALLY TO MEET THE ELECTRICAL AND THERMAL CHARACTERISTICS OF THE SWITCH (3) SEEDING THE GAS TO ACHIEVE POSITIVE CONTROL OF THE EVENTS THAT OCCUR DURING A SPARK DISCHARGE AND ALSO IN ORDER TO OBTAIN A DIFFUSED SPARK (4) SEQUENCING THE AFORESAID OPERATIONS IN ORDER TO OBTAIN THOSE ELECTRICAL AND THERMAL CHARACTERISTICS SO AS TO INSURE RELIABILITY AND MAINTAINABILITY. AS A RESULT OF THE ABOVE OUTLINED RESEARCH PROCEDURES WE WILL BE ABLE TO DEVELOP A SWITCH THAT CAN BE USED FOR SUSTAINED OPERATION THAT IS RELIABLE AND REQUIRES MINIMUM MAINTENANCE.



FISCAL YEAR 1986

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PROSPECTIVE COMPUTER ANALYSTS INC 1800 NORTHERN BLVD ROSLYN, NY 11576 R GLENN WRIGHT TITLE: EXPERT SYSTEM FOR TEST PROGRAM SET FAULT CANDIDATE SELECTION T 14 OFFICE: ARDC/SMCAR	ARMY	\$ 49,919

THIS PROPOSAL DESCRIBES AN APPROACH FOR THE DEVELOPMENT OF AN EXPERT SYSTEM TO ASSIST IN MINIMIZING THE QUANTITY OF UUT FAULT INSERTIONS DURING VERIFICATION AND VALIDATION OF TEST PROGRAM SETS. THE PROJECT OBJECTIVES ARE: EVALUATE AND CATALOGUE RULES APPLICABLE TO THE SELECTION OF LRU AND SRU FAULTS, CONSIDERING BOTH UUT AND TIPS REQUIREMENTS; EVALUATE AND CATALOGUE EXAMPLES OF CAUSE AND EFFECT RELATIONSHIPS OF FAULT INSERTION IN ELECTRONIC CIRCUITS; TO EVALUATE COMMERCIALY AVAILABLE SOFTWARE TOOLS, INFERENCE ENGINES, TEST EDITORS AND GRAPHICS GENERATORS, AND DEBUGGING TOOLS USED FOR THE DEVELOPMENT OF EXPERT SYSTEMS AND SELECT THOSE APPROPRIATE FOR USE WITH THIS APPLICATION; AND TO DEVELOP AND IMPLEMENT A PROTOTYPE RULE-BASED AND/OR EXAMPLE-BASED EXPERT SYSTEM UTILIZING THE KNOWLEDGE BASE DEVELOPED AND ENGINEERING AIDS OBTAINED. THIS EFFORT WILL BE ACCOMPLISHED THROUGH THE CONSTRUCTION OF A KNOWLEDGE BASE BY DEFINING THE BASIC CONCEPTS INVOLVED IN LRU/SRU FAULT SELECTION, EXTRACTING THE RULES THEREOF, AND MODIFYING THE PROCEDURES USED BY HUMAN EXPERTS FOR APPLICATION IN KNOWLEDGE BASE. THESE CONCEPTS WILL THEN BE FORMALIZED INTO PARAMETERS ACCEPTABLE TO THE EXPERT TOOLS RESULTING IN THE CONSTRUCTION OF THE DATA STRUCTURES, DEFINITION OF DATA, CONTROL AND INFORMATION FLOW AND DEVELOPMENT OF AN EXECUTABLE PROGRAM REPRESENTATIVE OF THE BASIC MODEL OF THE EXPERT SYSTEM.

PROTEUS TECHNOLOGIES INC 12301 PARKLAWN DR ROCKVILLE, MD 20852 DR NORMAN G ANDERSON TITLE: DETECTION LOCALIZATION AND QUANTITATION OF DISEASE BASED ON SPECIFIC PROTEINS T 210 OFFICE: AMRDC/SGRD	ARMY	\$ 50,000
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THE OBJECTIVE IS TO DEVELOP RAPID, SPECIFIC, AND SENSITIVE METHODS FOR DETECTING, LOCALIZING, AND QUANTITATING THE EFFECTS OF TRAUMA,

FISCAL YEAR 1986

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OF CHEMICAL OR BIOCHEMICAL TOXIC AGENTS, OF IONIZING RADIATION, OR OF INFECTION IN INJURED, EXPOSED, OR INFECTED MILITARY PERSONNE. WE PROPOSED TO IDENTIFY SYSTEMATICALLY PROTEINS SPECIFIC TO ORGANS, TISSUES, CELL TYPES OR INFECTIOUS AGENTS USING HIGH RESOLUTION TWO-DIMENSIONAL ELECTROPHORESIS AND COMPUTERIZED IMAGE ANALYSIS AND DATA REDUCTION. CANDIDATE MARKER PROTEINS RECOVERED FROM GELS WILL BE USED TO PRODUCE ANTIBODIES, AND TESTS BASED ON THEM USED FOR DISEASE, INFECTION, OR INJURY-RELATED CELL LEAKAGE DETECTION IN PLASMA OR URINE. PHASE I FEASIBILITY STUDIES WILL BE DONE IN MICE, WHILE PHASE II STUDIES WILL BE RAPIDLY EXTENDED TO MAN. WE HAVE DEVELOPED THE REQUISITE METHODS FOR RUNNING LARGE NUMBERS OF 2-D ANALYSES, FOR COMPUTERIZED INTERCOMPARISON OF 2-D MAPS, FOR ISOLATING PROTEIN FROM SPOTS OF INTEREST, AND FOR PRODUCING POLYVALENT ANTIBODIES AGAINST THE PROTEINS RECOVERED.

PRT CORP  
245 E SIXTH ST - STE 424  
ST PAUL, MN 55101  
RALPH H MCCARTNEY

AF

\$ 48,341

TITLE:

POWER-AUGMENTED EXOSKELETON DEMONSTRATION UNIT  
T 30 OFFICE: AD/YNS

THIS PROPOSAL DETAILS A DEVELOPMENT PROJECT WHICH WILL DEMONSTRATE FEASIBILITY OF A POWER-AUGMENTED EXOSKELETON. AN EXOSKELETON IS A JOINTED, EXTERNAL FRAMEWORK WORN BY A USER. FORCE SENSORS DETECT USER MOVEMENTS AND, THROUGH MODERN FEEDBACK CONTROL TECHNIQUES, POWER THE EXOSKELETON LIMBS. A USER'S STRENGTH CAN THUS BE MAGNIFIED THREE OR FIVE TIMES WITHOUT LOSS OF DEXTERITY OR SPEED. THE PROJECT IS DESIGNED TO PROVE FEASIBILITY OF HIGH SPEED CONTROL COUPLED WITH MODERN ACTUATOR TECHNOLOGY. THE PRIMARY PROJECT GOAL IS A SINGLE POWERED JOINT WITH AN ADJUSTABLE AMPLIFICATION FACTOR OF UP TO 10:1. SUCCESSFUL COMPLETION WOULD BE THE PRECURSOR TO A FULL EXOSKELETON.

PSM INC  
3866 INDIAN RIPPLE RD  
DAYTON, OH 45440  
DR AMIR FAGHRI

ARMY

\$ 49,220

TITLE:

AN INNOVATIVE METHOD FOR HAND PROTECTION IN EXTREME COLD  
TEMPERATURES USING HEAT PIPE TECHNOLOGY  
T 136 OFFICE: NRDC

DUE TO THE DANGER OF FROSTBIT OF THE FINGERS AT VERY LOW AMBIENT

FISCAL YEAR 1986

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TEMPERATURES, THERE IS A NEED TO DEVELOP HANDWEAR THAT WILL PROTECT THE FINGERS AT TEMPERATURES LOWER THAN THAT PROVIDED BY CURRENTLY AVAILABLE HADWEAR, WHICH PROTECTS DOWN TO ABOUT -60 DEG F. SINCE THE HUMAN PHYSIOLOGIC BLOOD FLOW RESPONSE TO LOWERED SKIN TEMPERATURE IS INADEQUATE TO PROVIDE THE HEATING NECESSARY TO PROTECT THE HANDS AND FINGERS, WE PROPOSE AN INNOVATIVE METHOD TO TRANSFER SOME OF THE BODY CORE THEMAL ENERGY TO THE HANDS. THIS METHOD INVOLVES THE USE OF THE HEAT PIPE, A NEW TECHNOLOGY WHICH HAS VERY HIGH EFFECTIVE HEAT CONDUCTIVITY, FAST RESPONSE TIME, FLEXIBILITY, LIGHTWEIGHT, AND A COMPACT FORM. WITH THE PROPER WORKING FLUID INSIDE THE HEAT PIPE, OPERATING TEMPERATURES CAN BE EXTENDED TO -80 DEG F. THE EMPHASIS IN THIS PHASE OF THE RESEARCH WOULD BE TO PROPOSE AND DESIGN A WORKING MODEL OF THE HANDWEAR SYSTEM WHICH WOULD ALLOW THE USER TO WEAR THE SYSTEM FOR A MINIMUM OF TWO HOURS.

PULSE SCIENCES  
14796 WICKS BLVD  
SAN LEANDRO, CA 94577  
DR RICHARD ADLER

DARPA \$ 50,000

TITLE:

HIGH GRADIENT INDUCTION MODULE DESIGN

T 18 OFFICE: DARPA

THE LIMITING ELEMENTS IN INDUCTION ACCELERATOR DESIGN ARE DETERMINED BY THE ACCEPTABLE VOLTAGE GRADIENTS ON KEY DESIGN COMPONENTS. WE HAVE ANALYZED THE PROBLEM FOR TYPICAL PARAMETERS (250 kV/STAGE, 10 kA, ns PULSE) AND FIND THAT KEY LIMITATIONS ARE THE FERRITE CORE BULK BREAKDOWN VOLTAGE, FERRITE CORE CAPACITANCE, VACUUM ELECTRODE ELECTRON EMISSION VOLTAGE, VACUUM/DIELECTRIC HIGH VOLTAGE INSULATOR SURFACE FALSHOVER VOLTAGE, AND THE ION EFFICIENCY OF METGLAS OR EQUIVALENT TAPE-WOUND CORES. IN OUR PROPOSED PHASE I PROGRAM, WE WILL COLLABORATE WITH DARPA PERSONNEL TO DEFINE REPRESENTATIVE MODULE PARAMETERS. DATA PRESENTLY UNAVAILABLE ON FERRITE BREAKDOWN STRENGTH AND PERMITTIVITY WILL BE GATHERED EXPERIMENTALLY. VARIOUS TECHNIQUES FOR CONFIGURING FERRITE CORES TO ACHIEVE HIGH GRADIENT (RADIAL STACKING, CAPACITIVE GRADING, AND OTHERS) ARE PROPOSED, AND THESE WILL BE STUDIED IN DETAIL TO DETERMINE THEIR UTILITY. WE WILL ALSO MANUFACTURE AND TEST Ni-Fe CORES WITH ULTRA-THIN LAMINATIONS USING A PROPRIETARY TECHNIQUE. THE DATA AND STUDIES DISCUSSED ABOVE WILL PROVIDE THE BASIS FOR A CONCEPTUAL HIGH GRADIENT MODULE DESIGN IN PHASE I. THE MOST PROMISING MODULE DF LIGNS WILL BE TESTED IN

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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## PHASE II.

PULSE SCIENCES 14796 WICKS BLVD SAN LEANDRO, CA 94577 DR RICHARD J ADLER TITLE: ION FOCUSED MICROWAVE AMPLIFIER T 82 OFFICE: AFWL/PRC	AF	\$ 77,653
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A NOVEL COMBINATION OF THE NEW TECHNIQUE OF ION FOCUSING AND CONVENTIONAL TRAVELING WAVE TUBE TECHNOLOGY IS PROPOSED. IF SUCCESSFUL, THIS COMBINATION WILL MAKE GIGAWATT AMPLIFIERS IN THE GIGAHERTZ RANGE FEASIBLE. IN PHASE I WE WILL STUDY A TRAVELING WAVE TUBE AMPLIFIER BUILT TO TEST THIS IDEA. LIMITATIONS DUE TO VELOCITY SPREAD AND ION MOTION WILL BE INVESTIGATED.

PULSE SCIENCES INC 14796 WICKS BLVD SAN LEANDRO, CA 94577 DR RICHARD ADLER TITLE: ADVANCED CATHODE FEASIBILITY DEMONSTRATION T 18 OFFICE: DARPA	DARPA	\$ 84,696
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EXISTING CATHODE TECHNOLOGY CANNOT PROVIDE THE COMBINATION OF HIGH AVERAGE CURRENT DENSITY AND LONG LIFE THAT IS ESSENTIAL FOR HIGH AVERAGE POWER ACCELERATOR APPLICATIONS. THESE APPLICATIONS INCLUDE HIGH POWER LASERS, HIGH POWER MICROWAVE GENERATORS, CHARGED PARTICLE BEAM CONCEPTS AND RADIATION PROCESSING. THE CONTROLLED POROSITY DISPENSER (CPD) CATHODE IS A NEW TYPE OF THERMIONIC EMITTER WHICH HAS ENORMOUS POTENTIAL TO MEET THESE CRITICAL NEEDS. THIS IS BASED ON THE PROJECTED CAPABILITIES TO PROVIDE HIGH, REPETITIVELY PULSED CURRENT DENSITY (>100 A/cm sq) AND LARGE EMISSION AREA (>100 cm sq) WITH LONG LIFE (>10<sup>9</sup>) PULSES) AND LOW SENSITIVITY TO POISONING. THE CPD IS A BARIUM DISPENSER-TYPE CATHODE IN WHICH THE NONUNIFORM POROUS TUNGSTEN MATRIX IS REPLACED WITH A TUNGSTEN FOIL CONTAINING SMALL, PRECISELY FORMED PORES. THE UNIFORM PORE SIZE AND SPACING COMBINED WITH THE LOW IMPEDANCE TO FLOW OF BARIUM FROM ITS RESERVOIR TO THE EMITTING SURFACE GIVES THIS CATHODE ITS ATTRACTIVE FEATURES WHICH

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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PROVIDE ORDER-OF-MAGNITUDE IMPROVEMENT IN EMITTER PERFORMANCE. THE PROPOSED EFFORT WILL DEVELOP SCALABLE (CPD) CATHODE DESIGNS AND DEMONSTRATE THE FEASIBILITY OF OPERATION AT HIGH CURRENT DENSITIES IN REPETITIVELY PULSED SYSTEMS.

PULSE SCIENCES INC 14796 WICKS BLVD SAN LEANDRO, CA 94577 DR JOHN R BAYLESS TITLE: ARC-SHATTERING CONCEPT FOR TUNNELING IN HARD ROCK T 5 OFFICE: AM/SBIR	DNA	\$ 49,525
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THERE IS A CRITICAL NEED FOR INNOVATIVE CONCEPTS FOR RAPID TUNNELING IN HARD ROCK. RESEARCH SPONSORED PARTLY BY DNA HAS RECENTLY INDICATED THAT IT MAY BE POSSIBLE TO FORM POWERFUL ELECTRICAL ARCS WITHIN HARD ROCK. THIS WOULD BE ACCOMPLISHED BY PLACING TWO ELECTRODES, SPACED UP TO SEVERAL FEET APART, AGAINST THE ROCK SURFACE AND PULSING THEM WITH HIGH VOLTAGE. A HIGH CURRENT ARC DISCHARGE IS EXPECTED TO FORM MANY INCHES BELOW THE SURFACE. THE DEPOSITION OF ARC ENERGY WOULD BE EQUIVALENT TO DETONATING HIGH EXPLOSIVE WITHIN THE ROCK, THEREBY REMOVING THE SURFACE LAYER. BY MOVING THE ELECTRODES FROM PLACE TO PLACE ON THE TUNNEL FACE AND REPETITIVELY PULSING THEM, RAPID MATERIAL REMOVAL RATES SHOULD BE ACHIEVABLE. PRELIMINARY ESTIMATES INDICATE THAT TUNNELING RATES OF 1,000 FEET PER DAY MAY BE POSSIBLE IN 20-FOOT DIAMETER TUNNELS WITH A 2 MEGAWATT SYSTEM COSTING LESS THAN \$1 MILLION (EXCLUDING DEBRIS REMOVAL). EXPERIMENTS WILL BE PERFORMED TO DEMONSTRATE THE FEASIBILITY OF THE ARC-SHATTERING CONCEPT. THEORETICAL MODELING WILL BE DEVELOPED TO ESTIMATE THE SCALING OF KEY PARAMETERS TO LARGE SYSTEMS, AND THE CONCEPTUAL DESIGN AND COSTING WILL BE SCOPED FOR A FULL SCALE TUNNELING MACHINE.

PULSE SCIENCES, INC. 14796 WICKS BLVD. SAN LEANDRO, CA 94577 RICHARD ADLER, PHD TITLE: ADVANCED CATHODE FEASIBILITY DEMONSTRATION T 1 OFFICE:	SDIO	\$ 84,696
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EXISTING CATHODE TECHNOLOGY CANNOT PROVIDE THE COMBINATION OF HIGH

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>BRIGHTNESS, HIGH AVERAGE CURRENT DENSITY AND LONG LIFE THAT IS ESSENTIAL FOR FREE ELECTRON LASER DEMONSTRATIONS. OTHER DIRECTED ENERGY CONCEPTS INCLUDING EXCIMER LASERS, PARTICLE BEAMS AND MICROWAVES WOULD ALSO BENEFIT SUBSTANTIALLY FROM IMPROVEMENTS IN CATHODE TECHNOLOGY. THE CONTROLLED POROSITY DISPENSER (CPD) CATHODE IS A NEW TYPE OF THERMIONIC EMITTER WHICH HAS ENORMOUS POTENTIAL TO MEET THESE CRITICAL SDIO NEEDS. THIS IS BASED ON PROJECTED CAPABILITIES TO PROVIDE HIGH, REPETITIVELY PULSED CURRENT DENSITY (<math>&gt;100</math> A/cm<sup>2</sup>), LARGE EMISSION AREA (<math>&gt;100</math> cm<sup>2</sup>), AND HIGH BRIGHTNESS (<math>&gt;10</math> TO THE 6TH POWER A/(rad-cm)<sup>2</sup>) WITH LONG LIFE (<math>&gt;10</math> TO THE 9TH POWER PULSES) AND LOW SENSITIVITY TO POISONING. THE CPD CATHODE IS A BARIUM DISPENSER-TYPE CATHODE IN WHICH THE NONUNIFORM POROUS TUNGSTEN MATRIX IS REPLACED WITH A TUNGSTEN FOIL CONTAINING SMALL, PRECISELY FORMED PORES. THE UNIFORM PORE SIZE AND SPACING COMBINED WITH THE LOW IMPEDANCE TO FLOW OF BARIUM FROM ITS RESERVOIR TO THE EMITTING SURFACE GIVES THIS CATHODE ITS ATTRACTIVE FEATURES WHICH PROVIDE ORDER-OF-MAGNITUDE IMPROVEMENT IN EMITTER PERFORMANCE. THE PROPOSED EFFORT WILL DEVELOP SCALABLE CPD CATHODE DESIGNS AND DEMONSTRATE THE FEASIBILITY OF OPERATION AT HIGH CURRENT DENSITIES IN REPETITIVELY PULSED SYSTEMS.</p>		

PULSE SCIENCES, INC.  
14796 WICKS BLVD.  
SAN LEANDRO, CA 94577  
JOHN R. BAYLESS, PHD

SDIO

\$ 59,992

## TITLE:

RELIABLE SPACE BASED HIGH VOLTAGE SYSTEMS DESIGN CONCEPTS

T 5 OFFICE:

FUTURE SDI ARCHITECTURES ARE EXPECTED TO INCORPORATE A VARIETY OF HIGH POWER SPACE-BASED SUBSYSTEMS WHICH MUST OPERATE AT HIGH VOLTAGES. THESE VOLTAGES CAN RANGE FROM HUNDREDS TO MILLIONS OF VOLTS WITH TEMPORAL VARIATIONS INCLUDING DC, PULSED AND RF WAVEFORMS. SUCH SUBSYSTEMS CAN INTERACT STRONGLY WITH THE NATURAL AND MAN-MADE SPACE ENVIRONMENTS WHICH CONTAIN PLASMA, ENERGETIC CHARGED PARTICLES, SHORT WAVELENGTH OPTICAL RADIATION, GAS AND MICROMETEORIDS. THESE INTERACTIONS MAY RESULT IN PLASMA DISCHARGES, ARCHING, CURRENT DRAINAGE, EMI, AND OPTICAL EMISSIONS WHICH COULD BE CATASTROPHIC. AT THIS TIME THERE IS ESSENTIALLY NO DATA BASE FOR HIGH-VOLTAGE INTERACTIONS ABOVE ABOUT 1 KV AND CONCEPTS DO NOT EXIST FOR MITIGATING THEIR EFFECTS. THE PROPOSED EFFORT WILL FOCUS ON THIS PROBLEM AREA BY: (1) DEFINING THE POTENTIAL PROBLEMS ASSOCIATED WITH HIGH-VOLTAGE/SPACE ENVIRONMENT

FISCAL YEAR 1986

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INTERACTIONS; (2) DEVELOPING CONCEPTS FOR MITIGATING DELETERIOUS EFFECTS; AND (3) DEFINING LABORATORY EXPERIMENTS TO CHARACTERIZE THE INTERACTIONS AND TO EVALUATE SELECTED MITIGATION CONCEPTS. THE EXPERIMENTS WOULD BE PROPOSED FOR THE PHASE II EFFORT.

Q-DOT INC  
1069 ELKTON DR  
COLORADO SPRINGS, CO 80907  
THOMAS E LINNENBRINK

NAVY

\$ 49,985

TITLE:

HIGH-SPEED HIGH-REPETITION RATE DIGITIZER

T 30

OFFICE: ONT/NCSC

AN INNOVATIVE TECHNIQUE IS PROPOSED TO ACQUIRE AND DIGITIZE 200 SAMPLES OF DATA TO 8-BIT ACCURACY AT 1 ns INTERVALS EVERY 67 ms. A UNIQUE CHARGE-COUPLED DEVICE (CCD) SAMPLES THE DATA AND TEMPORARILY STORES 200 SAMPLES AT 1 Gs/s. AT A SLOWER RATE, THIS SAME CCD CONVERTS THE 200 SAMPLES OF SAMPLED-ANALOG DATA TO A DIGITAL FORM COMPATIBLE WITH CONVENTIONAL MICROPROCESSORS AND DIGITAL MEMORY. IT CAN ACQUIRE AND CONVERT 200 SAMPLES OF DATA AT A 15 KHz REPETITION RATE. SIZE, WEIGHT, AND POWER ARE MINIMIZED BECAUSE THIS TECHNIQUE MINIMIZES HIGHER SPEED CIRCUITRY. THE RESULTING SYSTEM IS WELL SUITED AS A HIGH-PERFORMANCE ELEMENT OF TACTICAL MILITARY ELECTRO-OPTIC SCANNERS AND RADARS. IT CAN ALSO IMPROVE THE PERFORMANCE OF FUTURE COMMERCIAL DIGITAL OSCILLOSCOPES AND WAVEFORM RECORDERS.

QUANSCAN INC  
77 N OAK KNOLL AVE - #104  
PASADENA, CA 91101  
PAUL E WEST

ARMY

\$ 50,000

TITLE:

SCANNING TUNNELING MICROSCOPE FOR SUBMICRON DELINEATION IN SEMICONDUCTORS

T 81

OFFICE: LABCOM/ETDL

IMPROVING THE CAPABILITY FOR DELINEATING SUBMICRON FEATURES ON SEMICONDUCTORS IS NECESSARY FOR PRODUCING MORE POWERFUL DEVICES. THE COMMERCIAL SCANNING ELECTRON MICROSCOPE (SEM) FOR SUBMICRON IMAGING IS AVAILABLE BUT CUMBERSOM, EXPENSIVE, AND LIMITED IN RESOLVING POWER. RESOLUTION TO ATOMIC DIMENSIONS HAS BEEN DEMONSTRATED IN THE

FISCAL YEAR 1986

SUBMITTED BY

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LABORATORY WITH DEVELOPMENT OF THE SCANNING TUNNELING MICROSCOPE (STM). THIS INSTRUMENT OFFERS DIRECT IMAGING CAPABILITY TO SUBMICRON RESOLUTION AND PROMISES TO BE MORE CONVENIENT TO USE AND LOWER IN COST THAN THE SEM. HOWEVER, SEVERAL TECHNICAL PROBLEMS MUST BE SOLVED BEFORE A COMMERCIALLY VIABLE STM CAN BE REALIZED. WE PROPOSE TO STUDY THE FEASIBILITY OF DEVELOPING A COMMERCIALLY VIABLE STM THAT IS CAPABLE OF DISTINGUISHING FEATURES ON THE ORDER OF FIFTY ANGSTROMS. INNOVATIVE APPROACHES WILL BE SOUGHT TO PROBLEMS IN: STAG-ING USING PIEZOELECTRIC CERAMICS, PRODUCING TIPS RELIABLY, ISOLATING VIBRATIONS, AND PROVIDING LOW COST DATA PROCESSING CAPABILITY.

QUANTEX CORP  
2 RESEARCH CT  
ROCKVILLE, MD 20850  
DR JOSEPH LINDMAYER

AF

\$ 48,578

TITLE:

OPTICAL MATERIALS IN FIBER OPTICS UTILIZATION  
T 40 OFFICE: ESD/XRCT

THE AVAILABILITY OF FIBER OPTICS OPENS THE WAY OF INTEGRATING PHOTONIC COMPONENTS INTO THE FIBER; IN OTHER WORDS PERFORM AS MANY FUNCTIONS AS POSSIBLE ON THE OPTICAL SIGNAL ITSELF. QUANTEX HAS DEVELOPED SOME OPTICAL MATERIALS WHICH HAVE UNUSUAL PROPERTIES. THE PARTICULAR MATERIALS DISPLAY LARGE ELECTRON TRAPPING AND, THEREFORE, THEY ARE CALLED ET MATERIALS. THEY CAN PERFORM CERTAIN OPTICAL FUNCTIONS ALREADY AT THE EXPENSE OF A PUMP LIGHT. LIGHT LEVEL OPERATION ELIMINATES PROBLEMS WITH HEAT DISSIPATION, EMP, RADIATION HARDENING AND REDUCES WIRING. EXPLORATORY WORK IN THIS AREA IS PROPOSED.

QUANTEX CORP  
2 RESEARCH CT  
ROCKVILLE, MD 20850  
DR JOSEPH LINDMAYER

AF

\$ 49,130

TITLE:

NEW PHOTONIC MATERIALS FOR DIGITAL PROCESSING  
T 94 OFFICE: ASD/XR

NEW PHOTONIC SOLID STATE MATERIALS HAVE BEEN DISCOVERED BY QUANTEX. THE NEW MATERIALS DISPLAY LARGE ELECTRON TRAPPING (ET) AND ARE VERY



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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EFFICIENT. THEY READILY DISPLAY OPTICAL READ/WRITE/ERASE MEMORY CHARACTERISTICS AND APPEAR TO PROMISE OPTICAL SWITCHING. THE ENERGY IS MADE AVAILABLE THROUGH THE HIGH ENERGY TRAPPED ELECTRONS, WHICH IN TURN ARE ENERGIZED AT THE EXPENSE OF AN INDEPENDENT "POWER SUPPLY" LIGHT SOURCE. THE PHASE I WORK WILL CHARACTERIZE THE BASIC BEHAVIOR OF THESE UNIQUE MATERIALS AND WILL DEMONSTRATE SOME FUNDAMENTAL PHOTONIC FUNCTIONS; SUCH AS MEMORY AND SWITCHING.

QUANTEX CORP 2 RESEARCH CT ROCKVILLE, MD 20850 CHARLES Y WRIGLEY TITLE: ELECTRON TRAPPING OPTICAL READ/WRITE/ERASE MEMORY T 50 OFFICE: RADC/DOR	AF	\$ 49,130
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RECENTLY HIGH EFFICIENCY PHOSPHORS HAVE BEEN DEVELOPED AT QUANTEX. THESE MATERIALS CONTAIN EXTREMELY REPRODUCIBLE TRAPS, THEREFORE THEY ARE CALLED ET MATERIALS. THE ELECTRON TRAPPING FROM VISIBLE LIGHT PRODUCES EXTREMELY LONG TERM STORAGE, WHICH CAN BE INSTANTLY INTERROGATED BY INFRARED TO PRODUCE A VISIBLE OUTPUT. CONSEQUENTLY, A TOTALLY PHOTONIC READ/WRITE/ERASE MEMORY CAN BE CONSTRUCTED. IT IS PROPOSED TO FABRICATE EXPERIMENTAL FILM STRUCTURES WITH THESE ET MATERIALS AND EVALUATE PHOTONIC MEMORY PROPERTIES, IN TERMS OF INFORMATION DENSITY, THROUGHPUT RATES, SIGNAL-TO-NOISE RATIO, ETC.

QUANTEX CORP 2 RESEARCH CT ROCKVILLE, MD 20850 CHARLES Y WRIGLEY TITLE: NEW MATERIALS FOR HARDENED OPTICAL COMPUTERS T 1 OFFICE: AM/SBIR	DNA	\$ 74,937
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NEW MATERIALS DEVELOPED BY QUANTEX IN 1985 SHOW GREATLY IMPROVED PROPERTIES FOR APPLICATION TO OPTICAL COMPUTERS. A CLASS OF ELECTRON TRAPPING (ET) MATERIALS HAS BEEN GENERATED WHICH, UPON TRAP-CHARGING WITH VISIBLE LIGHT, MAINTAINS FILLED TRAPS INDEFINITELY. NEAR-INFRARED LIGHT (800 nm TO 1200 nm) TRIGGERS TRAPPED ELECTRON RELEASE, RESULTING IN EMITTED VISIBLE LIGHT. SUCH OPERATION APPEARS IMPERVI-

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>OUS TO EMP, STRUCTURAL DAMAGE EFFECTS SEEM MINIMAL AND POSSIBLE TRANSIENT RADIATION EFFECTS ARE ALSO MINIMAL. IT IS PROPOSED TO FABRICATE ET OPTICAL MEMORY (ETOM) STRUCTURES WITH READ-WRITE-ERASE AS A VEHICLE TO EVALUATE THE RADIATION HARDNESS OF THESE MATERIALS FOR OPTICAL COMPUTERS. MEASUREMENTS OF DATA STATUS, RESPONSE MAGNITUDES, RESPONSE TIMES AND TEMPERATURE DEPENDENCES WILL BE MADE BEFORE AND AFTER RADIATION DOSES DESIGNED FOR TRANSIENT IONIZATION, DISPLACEMENT DAMAGE AND EMP EFFECTS. IN THIS WAY, THE HARDNESS OF THESE NEW ET PHOTONIC MATERIALS WILL BE ASSESSED FOR APPLICATIONS IN VARIOUS THREAT ENVIRONMENTS.</p>		

QUANTEX CORP. 2 RESEARCH CT. ROCKVILLE, MD 20850 JOSEPH LINDMAYER, PHD TITLE: NEW MATERIALS FOR OPTICAL COMPUTATIONS T 11 OFFICE:	SDIO	\$ 99,798
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A NEW CLASS OF OPTICAL SOLID STATE MATERIALS HAVE BEEN DEVELOPED. THE NEW MATERIALS DISPLAY LARGE ELECTRON TRAPPING (ET) AND ARE VERY EFFICIENT. THEY COULD BE USED FOR OPTICAL READ/WRITE/ERASE MEMORIES AND FOR OPTICAL COMPUTATIONS. FOR OPTICAL PROCESSING THE TRAPS IN THE ET MATERIALS CAN BE FILLED AT THE EXPENSE OF AN INDEPENDENT "POWER SUPPLY" LIGHT SOURCE. THE PHASE I WORK WILL CHARACTERIZE THE BASIC BEHAVIOR OF THESE UNIQUE MATERIALS AND WILL DEMONSTRATE SOME FUNDAMENTAL PHOTONIC FUNCTIONS; SUCH AS MEMORY AND SWITCHING.

QUANTIC INDUSTRIES INC 990 COMMERCIAL ST SAN CARLOS, CA 94070 OLIVER J EDWARDS TITLE: NON-CONTACTING RANGING SYSTEMS FOR COLLISION AVOIDANCE T 65 OFFICE: NAVSEA	NAVY	\$ 66,960
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FOR ROBOT APPLICATIONS, METHODS ARE PROPOSED FOR SENSING AND MEASURING THE RANGE AND BEARING OF OBSTACLES OR POTENTIAL OBSTACLES, USING ELECTRO-OPTICS TECHNIQUES. CONVENTIONAL ACOUSTIC OR RADAR RANGEFINDING WILL NOT SUFFICE FOR THIS PURPOSE, BUT THE USE OF

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>STRUCTURED LIGHT AND/OR TRACKING OF THE CONJUGATE DISTANCE OF THE IMAGED SCENE IS SHOWN TO BE A FEASIBLE AND USEFUL APPROACH. THE PROPOSED MODULE WILL OUTPUT RANGE AND AZIMUTH OF THE NEAREST REFLECTIVE ELEMENT, AROUND THE HORIZON. THE PROJECT OBJECTIVES ARE: TO REFINE THE PROBLEM DESCRIPTION, IN THE CONTEXT OF PRACTICAL NEAR-TERM TECHNOLOGY; TO ANALYTICALLY AND EXPERIMENTALLY EVALUATE A HALF-DOZEN DESCRIBED CANDIDATE SYSTEMS APPROACHES; AND TO DEVELOP A PROGRAM PLAN FOR HARDWARE IMPLEMENTATION OF THE INTEGRATED MODULE DESIGN IN A PHASE II EFFORT.</p>		

QUANTIC INDUSTRIES INC 990 COMMERCIAL ST SAN CARLOS, CA 94070 WILLIAM MARSHALL TITLE: KINETIC DELIVERY OF HIGH-EXPLOSIVE WARHEADS T 191            OFFICE: BMO/MYSC	AF	\$ 75,428
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THE USE OF HIGH-EXPLOSIVE, KINETIC-PENETRATION WARHEADS IS INHIBITED BY THE LACK OF FUZING SYSTEMS WHICH CAN ACCURATELY LOCATE THE WARHEAD WITH RESPECT TO PENETRATION POINT. DESIGNING SUCH FUZE IS COMPLICATED BY THE SEVERE DECELERATION ENVIRONMENT AND THE AVAILABILITY OF ENVIRONMENTAL SENSORS AND FIRING SYSTEMS WHICH CAN DETERMINE WHEN TO OPTIMALLY INITIATE THE WARHEAD AND PERFORM THE INITIATION WITH SUFFICIENT SPEED AND RELIABILITY. QUANTIC PROPOSES TO SOLVE THIS PROBLEM BY THE APPLICATION OF TWO TECHNOLOGIES. FIRST, A THREE AXES, HARDENED, SOLID-STATE ACCELEROMETER, COUPLED WITH A MICROPROCESSOR, WILL BE USED TO "TRACK" THE PENETRATION IN REAL TIME IN X, Y, Z COORDINATES FROM POINT OF IMPACT. SECOND, AN ALL-ELECTRONIC EXPLODING FOIL INITIATOR (EFI) WILL BE USED TO FIRE THE WARHEAD BOOSTER. THE EFI SYSTEM IS INTRINSICALLY HARD AND OFFERS THE POTENTIAL FOR AN ALL ELECTRONIC SAFE AND ARM (S&A) WHICH CAN USE ENVIRONMENTAL SENSORS FOR THE ARMING FUNCTION. EFI SYSTEMS ARE CURRENTLY UNDER DEVELOPMENT AT QUANTIC. THE ALL SOLID-STATE, CAPACITANCE-BASED ACCELEROMETERS ARE UNDER DEVELOPMENT BY SILICON DESIGN, INC. UNDER A SEPARATE SBIR PROGRAM.

QUANTIC INDUSTRIES INC 990 COMMERCIAL ST SAN CARLOS, CA 94070 WILLIAM MARSHALL TITLE: DELAY TIMER FOR HARD TARGET PENETRATION FUZE T 27            OFFICE: AFATL/MNF	AF	\$ 58,538
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THIS DESCRIBES A TRANSISTOR-CIRCUIT TIME DELAY SUITED TO HARD TARGET

FISCAL YEAR 1986

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APPLICATIONS SINCE IT USES A THERMAL TIME-CONSTANT RATHER THAN CAPACITORS OR CRYSTALS TO DETERMINE TIME. DESIGN GOALS ARE TIME DELAYS OF 5 MILLISECONDS TO 10S OF SECONDS AT 5% ACCURACY OR BETTER. THIS TIMER, POWERED BY A "SUPERCAP," IS CONSTRUCTED OF COMPONENTS KNOWN TO SURVIVE EXTREMELY HIGH G-FORCES.

QUANTIC INDUSTRIES INC  
990 COMMERCIAL ST  
SAN CARLOS, CA 94070  
WILLIAM MARSHALL  
TITLE:

AF

\$ 68,633

MAGNETIC SWITCH FOR IMPROVED SAFETY OF IN-LINE SAFS  
T 27 OFFICE: AFATL/MNF

QUANTIC INDUSTRIES OFFERS THIS CONCEPT FOR IMPROVING SAFETY AND RELIABILITY OF IN-LINE FUZING. AN IMMEDIATE APPLICATION IS THE UNIVERSAL AIR DELIVERED SAFE AND ARM. THIS TERM IS A MAGNETICALLY ACTUATED SWITCH TO PREVENT INADVERTENT ARMING OF AN IN-LINE FUZE. THIS SWITCH IS BUILT INTO THE CORE OF THE FUZE'S HIGH VOLTAGE TRANSFORMER. TRANSFORMER ACTION IS PREVENTED BY A PORTION OF THE CORE BEING SATURATED BY A PERMANENT MAGNET. THE SWITCH IS ENABLED BY OPPOSING THE MAGNET'S FLUX WITH A DC CURRENT THROUGH A COIL WOUND AROUND THE MAGNET. THIS SWITCH IS PARTICULARLY SUITED TO BOMB OR DISPERSE APPLICATIONS WHERE THE AIR TURBINE'S OUTPUT POWER CAN BE EXCESSIVE, AND THEREFORE THE FUZE IS NOT ENERGY LIMITED. THE SWITCH WOULD BE ENABLED BY ENVIRONMENTAL MEANS.

QUEST CO  
15-F WOODLAND AVE  
BLOOMFIELD, CT 06002  
DR NIKOLAY SHKOLNIK  
TITLE:

DARPA

\$ 50,000

LOW COST HIGH EFFICIENCY WALKING ROBOTIC VEHICLE (WRV) DESIGN  
T 14 OFFICE: DARPA

AT PRESENT THE PROBLEMS OF OBTAINING A LOW COST, HIGH EFFICIENCY LEGGED VEHICLE ARE HAMPERING THE DEVELOPMENT OF TRULY MOBIL, INTELLIGENT ROBOTS, CAPABLE OF LOCOMOTION SIMILAR TO OR SURPASSING THAT OF HUMANS. THESE ROBOTS COULD IDEALLY BE SUITED FOR USE IN AN ENVIRONMENT TOO HAZARDOUS FOR HUMANS, SUCH AS REACTOR CAVITIES IN THE NU-

FISCAL YEAR 1986

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CLEAR PLANTS WHERE LEVEL OF BACKGROUND RADIATION IS EXTREMELY HIGH OR IN THE VARIOUS SECURITY SYSTEMS. ANOTHER VERY IMPORTANT POINT IS THAT MOBILITY ISSUES ARE OF FUNDAMENTAL IMPORTANCE FOR FUTURE DEVELOPMENT OF ARTIFICIAL INTELLIGENCE (AI) AND ROBOTICS IN GENERAL. THIS PROGRAM, IN PHASE I, WILL ESTABLISH SPECIFIC DESIGN PARAMETERS FOR DEVELOPMENT OF A LOW COST, HIGH EFFICIENCY AND HIGH POWER-TO-WEIGHT RATIO WALKING VEHICLE WITH LEG'S GEOMETRY BASED UPON THE MODIFIED PEAUCELLIER'S MECHANISM. PHASE II WILL INCLUDE THE DETAILED DESIGN, CONSTRUCTION AND TESTING OF A GENERAL PURPOSE WALKING ROBOTIC VEHICLE (WRV).

QUESTRON CORP 10220 SORRENTO VALLEY RD SAN DIEGO, CA 92121 GEORGE B GILLOW TITLE: HARDENED LIGHT MISSILE COMPUTER SYSTEM T 214 OFFICE: BMO/MYSC	AF	\$ 49,571
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RAPID TECHNOLOGICAL DEVELOPMENTS IN MISSILE FUNCTION AND DEFENSE WEAPONS ADVANCE REQUIRE THE IMPLEMENTATION OF RADIATION HARDENED, HIGH PERFORMANCE MISSILE COMPUTERS WHICH MEET SIGNIFICANT SIZE AND WEIGHT CONSTRAINTS. IN ORDER FOR U.S. MISSILE TECHNOLOGY TO MEET INCREASING FUTURE THREATS, MISSILE COMPUTERS MUST BE IMPLEMENTED WITH RADIATION HARDENED VHSIC TECHNOLOGY. DIFFERENT COMPUTER ARCHITECTURES SUCH AS REDUCED INSTRUCTION SET (RISC), PIPELINING, AND PARALLELISM NEED TO BE INVESTIGATED AND OPTIMIZED TO VHSIC DEVICE IMPLEMENTATION YET ACHIEVING HIGH PERFORMANCE. BASED ON ARCHITECTURE AND TECHNOLOGY ISSUES, VHSIC DEVICES WILL BE PARTITIONED TO ACHIEVE MINIMUM DEVICE COUNT AND ACHIEVE RADIATION HARDNESS.

QUESTRON CORP 10220 SORRENTO VALLEY RD SAN DIEGO, CA 92121 ARTHUR L FRIEDMAN TITLE: NUCLEAR SURVIVABILITY OF NON-DEVELOPMENTAL ITEMS T 92 OFFICE: LABCOM/HDL	ARMY	\$ 48,658
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ACQUISITION OF NEW ELECTRONIC SYSTEMS THAT MUST BE HARDENED FOR

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>INITIAL NUCLEAR RADIATION (INR) REQUIRES INCREASED LEAD TIMES AND GREATER ENGINEERING AND PRODUCTION COSTS. THE CURRENT THRUST OF THE DOD IS TO PURCHASE NDI WHERE PRACTICAL. THIS STUDY ASSESSES THE FEASIBILITY AND PRACTICALITY OF INCORPORATING NUCLEAR HARDENING INTO NDI. THE STUDY WILL EXAMINE THE TYPES OF EQUIPMENT THAT ARE CANDIDATES FOR HARDENING, THE VARIOUS EXPECTED NUCLEAR ENVIRONMENTS, THE GENERIC CLASSES OF COMPONENTS EMPLOYED IN THE EQUIPMENT, PACKAGING TECHNIQUES AND MATERIALS EMPLOYED, THE CATEGORIES AND RANGES OF FEASIBLE MODIFICATIONS TO THE EQUIPMENT, THE VARIOUS PRACTICAL NDI HARDENING CONCEPTS, AND WILL MAKE RECOMMENDATIONS FOR HARDENING THE EQUIPMENT AND FOR INCORPORATING HARDNESS ASSURANCE/HARDNESS MAINTENANCE PROCEDURES INTO PRODUCTION OF THE MODIFIED EQUIPMENT.</p>		

QUINTUS COMPUTER SYSTEMS INC 2345 YALE ST PALO ALTO, CA 94306 DR EDWARD STABLER TITLE: INTERACTIVE INSTRUCTIONAL SYSTEMS BASED ON MODULAR SYSTEMIC PARSERS (IIS/MSP) T 9 OFFICE: ONR	NAVY	\$ 48,824
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SYSTEMIC GRAMMARS DESCRIBE A NUMBER OF SEMANTIC AND PRAGMATIC DIMENSIONS OF HUMAN LANGUAGE THAT HAVE BEEN IGNORED BY SOME OF THE RESEARCH IN THEORETICAL LINGUISTICS. QUINTUS COMPUTER SYSTEMS PROPOSES A TWO PHASE PROJECT TO DESIGN AND DEVELOP A MODULAR, PRINCIPLE-BASED PARSER THAT CAN FORMULATE THE VARIOUS INDEPENDENT FUNCTIONAL DESCRIPTIONS OF AN UTTERANCE USING INDEPENDENT SYSTEMS OF PRINCIPLES OF THE SORT FOUND IN SYSTEMIC GRAMMAR. THIS PARSING SYSTEM WILL BE EMBEDDED IN A SIMILARY MODULAR FRAMEWORK FOR REPRESENTING DISCOURSE INFORMATION AND CONDUCTING INSTRUCTIONAL DIALOGUES BASED ON THE WORK THAT HAS BEEN DONE ON COMPUTER-AIDED INSTRUCTION. THIS LAST WILL COMPLETE A COMPREHENSIVE FORMAL THEORY OF INSTRUCTIONAL DIALOGUE, TOGETHER WITH A DESIGN FOR REALIZING THAT FRAMEWORK IN A FEASIBLE COMPUTING SYSTEM.

R & D AERONAUTICAL ENGINEERING CO INC PO BOX 1108 PLANO, TX 75074 JAMES SMISEK TITLE: REMOTE CONTROL FOR TARGET HELICOPTERS EVALUATION T 167 OFFICE: TECOM/WSMR	ARMY	\$ 48,971
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THIS PROJECT IS GEARED TO PRODUCE A CONCEPTUAL REMOTE CONTROL SYSTEM

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>OPTIMIZED FOR FULL-SCALE AND SUB-SCALE ROTARY WING SERIAL TARGETS AND ROTARY WING REMOTELY PILOTED VEHICLES (RRPV). EMPHASIS IS CENTERED UPON THE PECULIAR STABILITY REQUIREMENTS FOR REMOTE CONTROL OF HELICOPTERS, WHICH BY THEIR INHERENTLY UNSTABLE FLIGHT CHARACTERISTICS ARE NOT NECESSARILY FULLY NOR ADEQUATELY CONTROLLED BY CONVENTIONAL AIRCRAFT/AERIAL TARGET REMOTE CONTROL EQUIPMENT. THIS INVESTIGATION WILL INCLUDE THE DEFINITION OF FLIGHT OPERATION SCENARIOS, EVALUATION OF ALL CURRENTLY EMPLOYED CONTROL/TELEMETRY SYSTEMS, RESEARCH OF ALL APPLICABLE STATE-OF-THE-ART MOTION AND SPACIAL POSITION SENSORS WITH A GOAL OF DEFINING THE APPROPRIATE FLIGHT CONTROL CONCEPT APPLICABLE TO THE CURRENT AND FUTURE ROTARY WING REMOTE CONTROL REQUIREMENTS, AND THE DEFINITION OF A COMMON INTERFACE SCHEME. THE PROJECT HAS AN ULTIMATE GOAL OF HARDWARE DEVELOPMENT IN PHASE II TO DEMONSTRATE AN ADVANCED REMOTE CONTROL CAPABILITY SPECIFICALLY DESIGNED FOR ROTARY WING APPLICATION WHICH WILL FULLY ENABLE THE MILITARY USER TO EXPLOIT THE TOTAL FLIGHT ENVELOPE OF HIS ROTARY WING SERIAL TARGETS AND RRPV'S.</p>		

RA ASSOCS PO BOX 7 KLAMATH FALLS, OR 97601 RICHARD A KING TITLE: PROM PROGRAMMING METHODOLOGY ASSESSMENT T 135 OFFICE: NWSC	NAVY	\$ 45,332
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RA ASSOCIATES PROPOSES TO INVESTIGATE CURRENT MANUFACTURER PROM PROGRAMMING ALGORITHMS AND RELIABILITY TESTS THAT SUPPORT THEM. THEY WILL ALSO POLL USERS FOR KNOWN RELIABILITY PROBLEMS WITH PROMS USING NEWER TECHNOLOGIES SUCH AS TITANIUM-TUNGSTEN AND SHORTED JUNCTIONS. SUGGESTED IMPROVEMENTS IN PROGRAMMING ALGORITHMS WILL BE SUGGESTED AND TESTED TO A LIMITED DEGREE. DURING PHASE II, INDEPTH TESTING WILL BE CONDUCTED.

RADCO 9488 VOLLMERHAUSEN DR COLUMBIA, MD 21046 DR DAVID M SCHWABER TITLE: ADVANCED PACKAGING FOR ARTILLERY SHELLS T 147 OFFICE: BRL/LABCOM	ARMY	\$ 50,000
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THE PURPOSE OF PHASE I IS TO COMPARE THE MECHANICAL PROPERTIES OF

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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NUMEROUS CLOSED-CELL, CROSS-LINKED POLYMERIC MATERIALS TO THOSE PROPERTIES OF THE CURRENT COMBUSTIBLE CASES. THE SAME MATERIALS TESTED ABOVE WILL ALSO BE INVESTIGATED FOR SUITABILITY AS EXTERNAL PACKAGING. THE ULTIMATE GOAL IS TO FIND A PRODUCT THAT IS ECONOMIC, LIGHT-WEIGHT, AND WITH A VOLUME EQUAL TO THE OLD CLOTH BAGS BUT WITH RIGIDITY CHARACTERISTICS OF THE CURRENT COMBUSTIBLE CASES.

RADIATION MONITORING DEVICES INC 44 HUNT ST WATERTOWN, MA 02172 DR GERALD ENTINE TITLE: NONDESTRUCTIVE DETERMINATION OF RESIN IN GRAPHITE COMPOSITES T 155            OFFICE: AFWAL/ML	AF	\$ 71,456
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THE ADVENT OF GRAPHITE REINFORCED COMPOSITES HAS LED TO SIGNIFICANT ADVANCES IN AIRCRAFT TECHNOLOGY. SUCH COMPOSITES ARE ESSENTIAL TO MODERN FLIGHT TECHNOLOGY BECAUSE OF THEIR EXCEPTIONALLY GOOD STRENGTH-TO-WEIGHT RATIOS AND MANY AIRCRAFT AND MISSILE COMPONENTS ARE NOW MADE FROM THESE MATERIALS. AN IMMEDIATE NEED EXISTS, HOWEVER, FOR A RELIABLE TECHNIQUE TO DETERMINE THE FIBER TO RESIN RATIO OF COMPOSITE COMPONENTS FOR QUALITY ASSURANCE AND PROCESS CONTROL. THE PROPOSED PROGRAM WILL EXAMINE A NOVEL, NONDESTRUCTIVE NUCLEAR TESTING TECHNIQUE FOR PERFORMING THIS MEASUREMENT. BOTH A NUCLEAR TRANSMISSION AND A NUCLEAR BACKSCATTER CONFIGURATION WILL BE EXAMINED. BY THE END OF THE PHASE I-PHASE II PROGRAM, A COMPLETE PROTOTYPE INSTRUMENT WILL HAVE BEEN CONSTRUCTED SUITABLE FOR TESTING A RELEVANT COMPOSITE MANUFACTURING SITES. THIS WORK WILL BE BASED IN PART ON PREVIOUS WORK PERFORMED AT RMD WHICH RESULTED IN THE SUCCESSFUL DEVELOPMENT OF AN INSTRUMENT TO MEASURE GLASS CONTENT IN FIBERGLASS REINFORCED COMPOSITES.

RADIATION MONITORING DEVICES INC 44 HUNT ST WATERTOWN, MA 02172 DR GERALD ENTINE TITLE: ENERGY COMPENSATED SOLID STATE GAMMA SENSOR T 72            OFFICE: CECOM/AMSEL	ARMY	\$ 73,350
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A KEY REQUIREMENT FOR THE SUCCESS OF THE NEW, TACTICAL RADIATION



FISCAL YEAR 1986

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AMOUNT

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DOSIMETRY INSTRUMENTATION NOW BEING DEVELOPED BY THE ARMY IS TO HAVE AN ENERGY COMPENSATED, SOLID STATE GAMMA RAY SENSOR. ATTEMPTS TO USE TRADITIONAL FILTERING TECHNIQUES TO ACHIEVE A FLAT ENERGY RESPONSE HAVE NOT BEEN SUCCESSFUL AND A NEW APPROACH IS REQUIRED. WE PROPOSE TO UTILIZE RECENTLY AVAILABLE, INEXPENSIVE DIGITAL MICROCHIPS TO ELECTRONICALLY ACHIEVE THE GOAL. IN PHASE I OF THE PROGRAM, WE WILL FOCUS ON THE DETAILED ANALYSIS OF THE DETECTOR RESPONSE AND ON THE ALGORITHMS REQUIRED TO CORRECT IT AND ALSO ON THE CONCEPTUAL DESIGN OF THE ELECTRONICS. IN PHASE II WE WILL COMPLETE THE DEVELOPMENT OF THE MATHEMATICS AND PRODUCE PROTOTYPE SYSTEMS WHICH WILL BE TESTED FOR ENERGY RESPONSE IN CONJUNCTION WITH THE OTHER RELEVANT SPECIFICATIONS IMPOSED BY THE REQUIREMENT OF THE FINAL INSTRUMENT. BY THE END OF THIS PROGRAM, AN INEXPENSIVE, FULLY TESTED DETECTOR-ELECTRONIC DESIGN FOR THE GAMMA DOSE RATE SENSOR SHOULD BE READY FOR IMMEDIATE INCORPORATION INTO THE POCKET DOSIMETER OR OTHER PENDING ARMY NUCLEAR INSTRUMENTATION.

RADIATION MONITORING DEVICES, INC.

SDIO

\$ 75,965

44 HUNT ST.

WATERTOWN, MA 02172

GERALD ENTINE, PHD

TITLE:

MASS DISCRIMINATOR SENSOR

T 3 OFFICE:

THE PRIMARY GOAL OF STRATEGIC DEFENSE INITIATIVE IS TO REDUCE THE THREAT OF NUCLEAR WAR BY DEVELOPING A SYSTEM OF DEFENSES AGAINST NUCLEAR WEAPONS WHICH MAKES THEM OBSOLETE. THIS DEFENSIVE SYSTEM WILL HAVE TO IDENTIFY, TRACK, AND DESTROY MISSILES CONTAINING NUCLEAR WARHEADS AS THEY TRAVEL TO THEIR TARGETS. DEVELOPING THE ABILITY TO DISCRIMINATE TARGETS, THAT IS TO DISTINGUISH ENEMY WARHEADS FROM DECOYS, IS ONE OF THE MAJOR HURDLES WHICH WILL HAVE TO BE OVERCOME. MOST COMMON METHODS WHICH COULD BE USED FOR DISCRIMINATING TARGETS CAN BE EASILY FOOLED BY LOW DENSITY DECOYS. ONE PROPERTY, HOWEVER, WHICH CAN BE USED TO DISCRIMINATE TARGETS IS MASS. FOR EXAMPLE, TARGETS COULD BE DISTINGUISHED FROM LOW MASS DECOYS BY NUCLEAR EXCITATION USING PARTICLE BEAMS IF SUITABLE GAMMA RAY SENSORS COULD BE PRODUCED. SUCH A SENSOR WOULD HAVE TO BE SENSITIVE BUT COMPACT AND PREFERABLY OPERATE WITH NO COOLING AND NO SENSOR AVAILABLE TODAY CAN MEET ALL OF THE REQUIREMENTS. RECENTLY, HOWEVER, AN IMPROVED CdTe SENSOR WAS INVENTED WHICH CAN BE MADE MUCH LARGER AND THUS MORE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
SENSITIVE THAN STANDARD CdTe SENSORS AND APPEARS TO BE IDEALLY SUITED FOR THIS APPLICATION. THUS, THIS PROGRAM WILL INVESTIGATE THE FEASIBILITY OF USING THIS SENSOR AS A MASS DISCRIMINATOR.		

RALCON CO (FORMALLY: PULSON IND) 755 S 200 W RICHMOND, UT 84333 RICHARD D RALLISON TITLE: OPTIMIZING THE PERFORMANCE OF VOLUME HOLOGRAPHIC MEDIA T 68 OFFICE: CECOM/AMSEL	ARMY	\$ 50,000
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CURRENTLY AVAILABLE VOLUME HOLOGRAPHIC RECORDING MATERIALS OFFER IMPROVED EFFICIENCY, SIGNAL TO NOISE AND ENVIRONMENTAL STABILITY. THE OPTIMUM PREDICTED BEHAVIOR AND PERFORMANCE OF CERTAIN OF THE MOST PROMISING MATERIALS IS INVESTIGATED IN THIS DEVELOPMENT PROPOSAL. DCG IS THE STANDARD FOR PERFORMANCE WITH ALL OTHER MEDIA COMPETING FOR PREFERENCE. THREE MEDIA OF PARTICULAR INTEREST FOR THIS STUDY ARE PVK, DMP-128, AND DUPONT'S PHOTOPOLYMER. EACH OF THESE HAS ENVIRONMENTAL STABILITY ADVANTAGES OVER DCG BUT EACH HAS YET TO BE PUSHED TO PERFORM OPTICALLY IN SPECIFIC CONFIGURATIONS AT OR ABOVE THE LEVEL OF DCG. PVK AND DMP-128 HAVE BOTH BEEN MADE TO PERFORM WELL IN THIN THICK, LOW INDEX GEOMETRIES. THE GENERAL BEHAVIOR AND THE LIMITS OF PERFORMANCE OF THESE MEDIA MEASURED ABSOLUTELY AND COMPARED QUALITATIVELY TO DCG WILL BE DETERMINED. MANUFACTURABILITY OF PRODUCTS IN THE MOST DESIRABLE MEDIA WILL BE STUDIED ON GLASS AND PLASTIC SUBSTRATES. OF PARTICULAR INTEREST IS THE POSSIBILITY OF CONTINUOUS PRODUCTION ON ROLLS OF PLASTIC. THE PRINCIPLE INVESTIGATORS HAVE ALREADY FAMILIARIZED THEMSELVES WITH EACH OF THE PROPOSED MATERIALS AND PERFORMED PRELIMINARY EXPERIMENTS WITH PVK, AND DMP-128. THE COMPANY HAS MADE OVER 1,000,000 DCG HOLOGRAMS ON GLASS OR PLASTIC ALREADY.

RALCON CO (FORMALLY: PULSON IND) PO BOX 98 - 755 S 200RD W RICHMOND, UT 84333 RICHARD D RALLISON TITLE: TRANSMISSION HOLOGRAMS FOR HUDS T 126 OFFICE: AFWAL/FI	AF	\$ 54,608
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THE DESIGN AND FABRICATION OF TWO KINDS OF TRANSMISSION DIFFRACTIVE

FISCAL YEAR 1986

SUBMITTED BY

DEPT

AWARDED  
AMOUNT

OPTICS IS PROPOSED. THE OPTICS ARE TO REPLACE BULKIER AND HEAVIER REFRACTIVE OPTICS. THE USE OF A CONVENTIONAL LENS DESIGN PROGRAM IS SUGGESTED WITH MODIFICATIONS MADE BY THE INVESTIGATOR. A SIMPLE PROGRAM BY DON SMALL OPTICS IS ADAPTED FOR DIFFRACTION USE ON A PC. TWO SYSTEMS USING ON AXIS TECHNIQUES BY BACK TO BACK CONJUGATE HOLOGRAMS WITH AND WITHOUT 3M LIGHT CONTROL FILM ARE PROPOSED. A NOVEL MASTER COPY PROCESS WHERE THE ORIGINAL MASTER IS MADE AT 545 nm IN SILVER GRAIN FILM IS PREFERRED. SUBSEQUENT PROCESSING YIELDS ON SHG MASTER SUITABLE FOR BLUE COPY WAVELENGTHS. WELL WORKED OUT COPY SCHEMES INTO DCG PRODUCE CORRECT BRAGG TILT AND HIGH EFFICIENCY COPIES. THE PRINCIPAL WORKERS HAVE PRODUCED MANY THOUSANDS OF HOES USING SIMILAR PROCESSES OVER A 10 YEAR PERIOD. METHODS FOR ELIMINATING ALL TYPES OF ABERRATION ARE IDENTIFIED, FOR ON AXIS OPERATION. TWO MEDIUMS ARE PROPOSED AND EQUALLY GOOD CHOICES. DCG FOR PRIMARY WORK AND PVK FOR POSSIBLE SPECIAL ENVIRONMENTS.

RAMP CORP

DARPA

\$ 49,130

1008 140TH AVE NE - STE 103

BELLEVUE, WA 98005

RODERIC A CARR

TITLE:

MICROCOMPUTER EXPERT SYSTEM FOR FEDERAL CIRCUIT MANAGEMENT  
FEASIBILITY STUDY

T 16

OFFICE: DARPA

RAMP CORPORATION PROPOSES TO ACCOMPLISH PERFORMANCE EVALUATION ON MICROCOMPUTER BASED EXPERT SYSTEMS FOR THE PURPOSE OF SELECTING A SYSTEM APPROPRIATE FOR USE IN FEDERAL CONTRACT MANAGEMENT SUPPORT. THE PROJECT OUTPUTS WILL BE A DEMONSTRATION MODULE FOCUSED ON CONTRACT CHANGES AND A FINAL REPORT WHICH DOCUMENTS THE SELECTION PROCESS AND PERFORMANCE EVALUATION CRITERIA UTILIZED IN THE EFFORT. THE EXPERT SYSTEM APPROACH IS SEEN AS A WAY TO PROVIDE EFFICIENT ENTRY INTO THE COMPLICATED KNOWLEDGE BASE REPRESENTED BY THE FAR AND ITS SUPPLEMENTS. THE GUIDANCE OF AN EXPERT SYSTEM MAY BE DEMONSTRATED IN THE WELL DEFINED WORLD OF CONTRACT CHANGES AND THEN EXTRAPOLATED INTO THE LARGER AND MORE COMPLEX WORLD OF THE FAR. SIGNIFICANT PRODUCTIVITY IMPROVEMENT SHOULD RESULT FROM A RIGOROUS TOOL THAT WILL SUPPORT CONTRACT MANAGEMENT PROCESSES FOR BOTH THE GOVERNMENT AND ITS OUTSIDE CONTRACTORS. THE EFFORT WILL ALSO ADVANCE THE EXPERIENCE BASE UPON WHICH SELECTION AND APPLICATION OF EXPERT SYSTEMS MAY BE MADE IN THE FUTURE. RAMP SEEKS TO DEVELOP A TOOL WHICH WILL BE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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CAPABLE OF RUNNING ON THE TYPICAL PC FOUND IN SUCH NUMBERS THROUGH-  
OUT THE GOVERNMENT AND INDUSTRY. IT ALSO SEEKS TO PROVIDE A TOOL  
WHICH IS IMMEDIATELY USEFUL WITHOUT LENGTHY TRAINING AND WHICH WILL  
PROVIDE A COMMON BASIS FOR COOPERATION AMONG ALL INVOLVED WITH  
GOVERNMENT CONTRACTING.

RASOR ASSOCIATES, INC.  
253 HUMBOLDT CT.  
SUNNYVALE, CA 94089  
NED S. RASOR

SDIO

\$ 73,087

## TITLE:

THERMAL MANAGEMENT CONCEPT FOR SPACE NUCLEAR POWER SYSTEMS  
T 4 OFFICE:

HEAT PIPES PROVIDE A HELPFUL DESIGN ALTERNATIVE TO CONVECTIVE LOOPS  
IN THE THERMAL MANAGEMENT OF SPACE NUCLEAR POWER SYSTEMS BECAUSE OF  
THEIR QUASI-ISOTHERMAL AND MODULAR CHARACTERISTICS. ULTIMATELY, HOW-  
EVER THE SYSTEM DESIGN MUST USE STRUCTURAL SOLIDS TO CONDUCT HEAT TO  
AND FROM THE CONVECTIVE LOOPS OR HEAT PIPES, AND ACCEPT THE OFTERN-  
SEVERE PERFORMANCE AND RELIABILITY PENALTIES ASSOCIATED WITH THE  
THERMAL AND OTHER PROPERTIES OF THOSE MATERIALS. A NEW TYPE OF SOLID  
STRUCTURES HAS BEEN CONCEIVED THAT HAS EXCEPTIONAL HEAT TRANSFER PRO-  
PERTIES SIMILAR TO THOSE OF HEAT PIPES, BUT THAT CAN BE FORMED INTO  
ANY SHAPE AND BEAR MECHANICAL LOADS LIKE OTHER SOLID STRUCTURES. IT  
IS PROPOSED THAT IN PHASE I THE BASIC DESIGN PRINCIPLES OF THIS NEW  
HEAT-TRANSFER STRUCTURE BE DEFINED ANALYTICALLY AND CONFIRMED EXPERI-  
MENTALLY USING READILY AVAILABLE LOW TEMPERATURE MATERIAL COMPONENTS.  
THE DATA AND INSIGHT OBTAINED THEN WILL BE USED TO EVALUATE PROSPECTS  
FOR THE USE OF SPECIFIC STRUCTURES FOR THERMAL MANAGEMENT IN SPACE  
NUCLEAR POWER SYSTEMS, AND TO PREPARE A DETAILED PHASE II PLAN FOR  
THE DEVELOPMENT AND DEMONSTRATION OF HIGH TEMPERATURE STRUCTURES FOR  
SUCH NUCLEAR SPACE POWER SYSTEM APPLICATIONS.

RASOR ASSOCS INC  
253 HUMBOLDT CT  
SUNNYVALE, CA 94089  
NED S RASOR

AF

\$ 69,881

## TITLE:

MULTIMEGAWATT SPACE POWER SYSTEM THERMAL MANAGEMENT CONCEPT  
T 180 OFFICE: AFWAL/PO

IN THE THERMAL MANAGEMENT OF SPACE NUCLEAR POWER SYSTEMS, HEAT PIPES

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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PROVIDE A HELPFUL DESIGN ALTERNATIVE TO CONVECTIVE LOOPS BECAUSE OF THEIR QUASI-ISOTHERMAL AND MODULAR CHARACTERISTICS. ULTIMATELY, HOWEVER THE SYSTEM DESIGNER MUST USE STRUCTURAL SOLIDS TO CONDUCT HEAT TO AND FROM THE CONVECTIVE LOOPS OR HEAT PIPES, AND ACCEPT THE OFTEN-SEVERE PERFORMANCE AND RELIABILITY PENALTIES ASSOCIATED WITH THE THERMAL AND OTHER PROPERTIES OF THOSE MATERIALS. A NEW TYPE OF SOLID STRUCTURE HAS BEEN CONCEIVED THAT HAS EXCEPTIONAL HEAT TRANSFER PROPERTIES SIMILAR TO THOSE OF HEAT PIPES, BUT THAT CAN BE FORMED INTO ANY SHAPE AND BEAR MECHANICAL LOADS LIKE OTHER SOLID STRUCTURES. IT IS PROPOSED THAT IN PHASE I THE BASIC DESIGN PRINCIPLES OF THIS NEW HEAT-TRANSFER STRUCTURE BE DEFINED ANALYTICALLY AND CONFIRMED EXPERIMENTALLY USING READILY AVAILABLE LOW TEMPERATURE MATERIAL COMPONENTS. THE DATA AND INSIGHT OBTAINED THEM WILL BE USED TO EVALUATE PROSPECTS FOR THE USE OF SPECIFIC STRUCTURES FOR THERMAL MANAGEMENT IN SPACE NUCLEAR POWER SYSTEMS, AND TO PREPARE A DETAILED PHASE II PLAN FOR THE DEVELOPMENT AND DEMONSTRATION OF HIGH TEMPERATURE STRUCTURES FOR SUCH NUCLEAR SPACE POWER SYSTEM APPLICATIONS.

RASOR ASSOCS INC  
253 HUMBOLDT CT  
SUNNYVALE, CA 94089  
NED S RASOR

NAVY \$ 73,087

## TITLE:

PASSIVE VARIABLE THERMAL RESISTANCE MATERIAL

T 145

OFFICE: NWSC

THERMAL MANAGEMENT HAS BECOME A MAJOR DESIGN CONSTRAINT IN ELECTRONIC AND HIGH-PRECISION DEVICES AS THEY ARE MINIATURIZED AND THEIR PERFORMANCE IS INCREASED. IN APPLICATIONS WHERE PASSIVE (CONDUCTION) COOLING IS REQUIRED, THE DEVICE DESIGNER IS FACED WITH THE DILEMMA OF CHOOSING A MATERIAL THAT HAS THE THERMAL RESISTIVITY REQUIRED TO MAINTAIN THE DESIRED LOCAL OPERATING TEMPERATURE WHEN THE THERMAL HEAT FLUX VARIES, BOTH IN LOCATION AND IN TIME. A COMPROMISE MUST BE MADE THAT RESULTS IN MECHANICALLY-DISTORTING TEMPERATURE GRADIENTS, DEVICE COMPLEXITY AND REDUCED PERFORMANCE. A PROPRIETARY NEW STRUCTURAL MATERIAL HAS BEEN CONCEIVED AT RASOR ASSOCIATES THAT AUTOMATICALLY VARIES ITS LOCAL THERMAL RESISTIVITY TO MAINTAIN A NEAR-CONSTANT TEMPERATURE OVER ITS BOUNDARIES FOR A WIDE RANGE OF HEAT FLUXES. VARIOUS POTENTIAL FORMS OF THIS MATERIAL INCLUDE ELECTRICAL INSULATORS AND CONDUCTORS, RIGID OR FLEXIBLE. IN THE PROPOSED PHASE I WORK, AN ANALYTICAL MODEL WILL BE DEVELOPED THAT DESCRIBES THE EFFECT

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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OF THE MATERIAL DESIGN VARIABLES ON ITS THERMAL PROPERTIES. THE VALIDITY OF THE MODEL WILL BE TESTED VIA AN EXPERIMENTAL MODEL OF THE MATERIAL THAT USES READILY AVAILABLE COMMERCIAL COMPONENTS. THE DATA AND DESIGN PRINCIPLES DEVELOPED THEN WILL BE USED TO EVALUATE PROSPECTS, AND TO PREPARE A DETAILED PHASE II PLAN, FOR DEVELOPMENT OF SPECIFIC FORMS OF THIS MATERIAL THAT ARE USEFUL IN NAVAL WEAPONS SUPPORT CENTER APPLICATIONS.

RE/SPEC INC 3815 EUBANK NE ALBUQUERQUE, NM 87111 MARK L BLANFORD TITLE: IMPROVED ANALYSIS AND INTERACTIVE CAPABILITIES FOR THE DYNAPAR SOFTWARE T 173	ARMY	\$ 49,955
OFFICE: TECOM/WSMR		

A TWO-PHASE PROJECT WILL PROVIDE DYNAPAR SOFTWARE ON THE DEC VAX-11/751 AND ADD INTERACTIVE CAPABILITY TO IT. DURING PHASE I, THE EXISTING DYNAPAR SOFTWARE THAT IS USED BY PERSONNEL AT THE ARMY MATERIAL AND EVALUATION DIRECTORATE AT THE WHITE SANDS MISSILE RANGE WILL BE MODIFIED TO RUN ON THE VAX-11/751. THE VAX IMPLEMENTATION WILL INCLUDE PROCEDURE FILES TO ASSIST IN THE EXECUTION OF A DATA REDUCTION RUN. PHASE II WILL FURTHER EXPAND THE SELECTION OF ANALYSIS PROGRAMS AND ADD INTERACTIVE FEATURES. A PARALLEL GOAL IS TO OFFER REPORT-READY GRAPHICAL DISPLAYS, EITHER THROUGH NEW PROGRAM DEVELOPMENT OR THROUGH UTILIZATION OF EXISTING CAPABILITIES.

REKENTHALER TECHNOLOGY ASSOCS CORP 3400 JENNINGS CHAPEL RD WOODBINE, MD 21797 TIMOTHY A ZIMMERLIN TITLE: RESOLUTION REQUIREMENTS FOR STRATEGIC TARGETS T 223	AF	\$ 49,950
OFFICE: BMO/MYSC		

THE RTA CORPORATION WILL DEMONSTRATE THE RESOLUTION REQUIREMENTS NECESSARY FOR DETECTION, CLASSIFICATION AND IDENTIFICATION OF FIVE DIFFERENT CLASSES OF MILITARY TARGETS, INCLUDING ICBM SILOS, MOBILE MISSILES, SHIPS, MULTI-ENGINE AIRCRAFT, AND GROUND FORCES (A TANK

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
<p>REGIMENT). ASSUMING SENSOR CHARACTERISTICS, RTA WILL EVALUATE THE UTILITY OF DETECTION ALGORITHMS AGAINST TARGET SIGNATURES. THE INFORMATION CONTENT INHERENT IN TARGET DATA TEST SETS WILL BE SEQUENTIALLY PROCESSED, MODIFIED, INTERPRETED AND DISPLAYED, USING RTA'S "PIPELINE" FOR DIGITAL IMAGE PROCESSING.</p>		

RELIABILITY SCIENCES INC (RSI) PO BOX 1841 MIDDLEBURG, VA 22117 EDWARD J MCMAHON TITLE: ELECTROSTATIC DISCHARGE (ESD) COMPONENT FIELD VS CONTACT SUSCEPTIBILITY T 141 OFFICE: NWSC	NAVY	\$ 39,565
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SINCE THE EARLY 1960S, IT HAS BEEN RECOGNIZED THAT "ELECTROSTATIC DISCHARGE" (ESD) CAN DAMAGE ELECTRONIC DEVICES. WITH THE PROGRESSIVE MICROMINIATURIZATION AND INCREASED COMPLEXITY OF ELECTRONIC DEVICES, MORE AND MORE DEVICES ARE BECOMING SUSCEPTIBLE TO DAMAGE FROM ESD. THIS CONTINUING TREND IS RESULTING IN MORE DEVICE BECOMING SUSCEPTIBLE TO ESD AT LOWER ESD VOLTAGE AND POWER LEVELS. IN THE DEVELOPMENT OF ESD SENSITIVITY DATA AND ESD SENSITIVITY CATEGORIES FOR DOD-STD-1686 AND DOD HDBK-263, ESD SENSITIVITY WAS BASED ON A DIRECT DISCHARGE TO THE MOST SENSITIVE PINS OF A DEVICE CONSIDERING THE HUMAN AS THE PRIMARY SOURCE OF THE ESD. IT WAS BELIEVED AT THAT TIME THAT THE DIRECT DISCHARGE WAS THE MOST SEVERE ESD CONDITION AND LITTLE DATA WAS AVAILABLE ON DEVICE SENSITIVITY DUE TO ELECTROSTATIC FIELDS ALTHOUGH THE EXPOSURE TO ELECTROSTATIC FIELDS IN A MANUFACTURING ENVIRONMENT IS A MORE PREVALENT CONDITION. THE INTENT OF THIS STUDY IS TO EVALUATE AND QUANTIFY, TO THE DEGREE POSSIBLE, THE EFFECTS OF ELECTROSTATIC FIELDS ON DEVICE ESD SENSITIVITY AND COMPARE THESE RESULTS WITH DEVICE SENSITIVITY.

REMOTE TECHNOLOGY CORP 114 UNION VALLEY ROAD OAK RIDGE, TN 37830 JOHN R WHITE TITLE: LOW COST MOBILE ROBOT T 14 OFFICE: DARPA	DARPA	\$ 49,332
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THE CONCEPTUAL DESIGN OF A LOW COST MOBILE ROBOT WILL BE PREPARED

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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UTILIZING PROVEN AND EXISTING TECHNOLOGY AND COMPONENT. REQUIREMENTS WILL BE ESTABLISHED BY SURVEYING POTENTIAL EDUCATIONAL AND LABORATORY USERS. ALTERNATE MODES OF MOBILITY WILL BE EVALUATED. MODULARITY AND INTERFACES WILL BE DEFINED FOR A VARIETY OF ADD-ON SENSORS INCLUDING VISION, SOUND, SONAR, HEAT AND MANIPULATIONS. ON-BOARD LOCAL PROCESSING AND BI-DIRECTIONAL TELECOMMUNICATIONS WILL BE SELECTED FOR COMPATIBILITY WITH USERS' FACILITIES AND PROCESSING SYSTEMS.

REMTECH INC 2603 ARTIE ST - STE 21 HUNTSVILLE, AL 35805 RICHARD E SOMERS TITLE: FLUID FILLED TRANSPARENCIES T 141 OFFICE: AFWAL/FI	AF	\$ 50,000
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CURRENT AIRCRAFT TRANSPARENCY MATERIAL AND SYSTEMS ARE INADEQUATE TO COPE WITH A NUMBER OF PRESENT AND FUTURE OPERATIONAL THREATS. THESE INCLUDE: AEROHEATING AT HIGH MACH NUMBERS; HIGH COCKPIT TEMPERATURES IN STAGNANT, SUNNY GROUND CONDITIONS; CONDENSATION; FLASH BLINDNESS FROM NUCLEAR BURSTS AT NIGHT; AND TRANSPARENCY DAMAGE FROM ENGAGEMENT WITH LASER RADIATION. THE PROPOSED STUDY WILL EXPLORE THE FEASIBILITY OF USING A TEMPERATURE, PHOTOCHROMIC, AND/OR COLOR CONDITIONED FLUID BETWEEN CHANNELED LAYERS OF A TRANSPARENCY SYSTEM TO DETERMINE THE DEGREE TO WHICH THE ABOVE THREATS CAN BE NULLIFIED. INITIAL EFFORTS WILL INVOLVE DEFINITIONS OF THE HEATING, RADIATION, AND ENVIRONMENTAL THREATS EXPECTED FOR A TYPICAL TRANSPARENCY SYSTEM. USING THESE DEFINITIONS ALONG WITH INFORMATION DEVELOPED ON CANDIDATE FLUIDS A BREADBOARD TEST ARRANGEMENT WILL BE DEFINED. TESTING WILL BE CONDUCTED WITH DIFFERENT FLUIDS TO DEMONSTRATE LIGHT RESPONSE OF PHOTOCHROMIC ELEMENTS AND PREDICTED HEATING AND COOLING SYSTEM PERFORMANCE. SUCCESSFUL PERFORMANCE WILL INDICATE VIABILITY OF THE CONCEPT AND DEFINE AVENUES FOR PHASE II WORK DEVELOPMENT.

RESEARCH OPPORTUNITIES INC 2225 E 28TH ST - BLDG 511 LONG BEACH, CA 90806 WILLIAM C RILEY TITLE: IMPROVED MISSILE STRUCTURES THROUGH THE USE OF GRAPHITE FIBER REINFORCEMENT T 55 OFFICE: NAVSEA	NAVY	\$ 48,900
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AN INDEPENDENT ASSESSMENT WILL BE MADE OF METHODS OF FABRICATING



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -- --	AWARDED AMOUNT -----
<p>COMPOSITES REINFORCED WITH HIGH STRENGTH AND HIGH MODULUS CARBON FIBERS. TRANSLATION OF FIBER PROPERTIES INTO COMPOSITE PROPERTIES WILL BE EVALUATED. MATRIX MATERIALS WILL INCLUDE APPROPRIATE ORGANICS, METALS, CARBON, AND CERAMICS. THE FEASIBILITY OF FABRICATING HYBRID COMPOSITES CONTAINING BOTH HIGH STRENGTH AND HIGH MODULUS FIBERS WILL BE ESTABLISHED. IN ORGANIC MATRICES EMPHASIS WILL BE ON HIGH CHAR YIELD THAT CAN FORM CARBON-CARBON IN SITU. METAL MATRIX WILL EMPHASIZE REINFORCED COPPER BECAUSE OF HIGH MELTING POINT AND OUTSTANDING THERMAL PROPERTIES. CARBON-CARBON WILL INVOLVE SPECIAL WEAVING TECHNIQUES TO HANDLE HIGH MODULUS, LOW STRAIN-TO-FAILURE FIBERS. CERAMIC MATRIX COMPOSITES WILL INVOLVE CHEMICAL VAPOR DEPOSITION OF SiC INTO A GRAPHITE PREFORM. EVALUATION OF ALL MATERIALS AND PROCESSES WILL BE MADE IN TERMS OF ANTICIPATED REQUIREMENTS IN ADVANCED MISSILE SYSTEMS.</p>		

RESOURCE TECHNOLOGIES GROUP INC 400 MISSISSIPPI ST MORGANTOWN, WV 26505 DR GEORGE D CASE TITLE: BIOAMPLIFIER MODULE FOR AMPLIFYING NERVE AGENT ALARM T 273                      OFFICE: AMD/RDO	AF	\$ 49,352
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AS PART OF AN OVERALL EFFORT TO DEVELOP AN AMPLIFYING ALARM MONITOR FOR NERVE AGENTS, A PROGRAM IS PROPOSED FOR THE VERIFICATION OF A BIOCHEMICAL SYSTEM TO MIMIC THE PHYSIOLOGICAL RECEPTOR MECHANISMS FOR NERVE AGENT TOXICITY, AND TO CONVERT THE CHEMICAL AND BIOCHEMICAL INFORMATION INTO AN OUTPUT WHICH CAN BE CONVERTED ELECTROCHEMICALLY INTO AN ELECTRONIC ALARM SIGNAL. THE PHASE I RESEARCH IS AIMED TOWARD THE VERIFICATION OF THE INITIAL TARGET FACE REACTIONS, AND THE VIABILITY OF THE MONITORING SYSTEM WHICH SUPPORTS ITS FUNCTION.

RIBBON TECHNOLOGY CORP PO BOX 30758 GAHANNA, OH 43230 THOMAS GASPAR TITLE: IN CHAMBER PRODUCTION OF TITANIUM ALLOY FOIL BY THE RAPID SOLIDIFICATION TECHNIQUE CALLED MELT OVERFLOW T 158                      OFFICE: AFWAL/ML	AF	\$ 49,560
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THE PRODUCTION OF A TITANITUM ALLOY FOIL FOR USE AS A BASE FOR METAL

FISCAL YEAR 1986

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MATRIX COMPOSITES SUCH AS SILICON CARBIDE - TITANIUM IS TO BE INVESTIGATED. THE ALLOY Ti-6Al-4V WILL BE CAST IN A VACUUM CHAMBER USING THE MELT OVERFLOW PROCESS. MELT OVERFLOW IS A VARIATION OF THE RAPID SOLIDIFICATION TECHNIQUE MELT SPIN AND IS CAPABLE OF ACHIEVING QUENCHING RATES OF UP TO 10(5) K/SEC. THE ADAPTABILITY OF THE MELT OVERFLOW PROCESS TO VACUUM CHAMBER CONDITION AND THE PARAMETERS EFFECTING THE CONTROL OF THE PROCESS IN CHAMBER WILL BE RESEARCHED. SAMPLES OF TITANIUM ALLOY FOILS WILL BE PRODUCED AND EVALUATED BY MICROSTRUCTURAL ANALYSIS. AN ATTEMPT WILL BE MADE TO RELATE PROCESS PARAMETERS TO THE CONDITIO OF THE FINAL PRODUCT.

RIBBON TECHNOLOGY CORP  
PO BOX 30758  
GAHANNA, OH 43230  
THOMAS GASPAR

ARMY \$ 49,731

## TITLE:

PLASMA MELT OVERFLOW - AN INNOVATIVE TECHNIQUE FOR PRODUCING RAPIDLY SOLIDIFIED HIGH INTEGRITY FOILS

T 126 OFFICE: LABCOM/MTL

THE COMBINATION OF MELT OVERFLOW WITH A LAMINER PLASMA JET MELTING SOURCE MAY PROVIDE AN ECONOMICAL MEANS OF PRODUCING RAPIDLY SOLIDIFIED REACTIVE METALS AND ALLOYS TO NEAR NET SHAPE. TO THIS END WE PROPOSE TO DESIGN AND ASSEMBLE AN IN CHAMBER LABORATORY MELT OVERFLOW UNIT USING A PLASMA ARC MELTING SOURCE. ONCE COMPLETED THE FEASIBILITY OF CASTING TITANIUM AND TUNGSTEN ALLOYS INTO FIBER, FILAMENT, OR FOIL WILL BE INVESTIGATED. IN ADDITION THE PLASMA MELT OVERFLOW UNIT WILL SERVE AS A MODEL TO EVALUATE THE TECHNICAL AND ECONOMIC QUESTIONS ASSOCIATED WITH THE NEW TECHNOLOGY. UPON COMPLETION OF THE PROJECT, SAMPLE QUANTITIES OF RAPIDLY SOLIDIFIED TUNGSTEN ALLOYS AND TITANIUM ALLOYS WILL BE PROVIDED FOR EVALUATION.

RIBI IMMUNOCHEM RESEARCH INC  
PO BOX 1409  
HAMILTON, MT 59840  
J TERRY ULRICH

ARMY \$ 50,000

## TITLE:

VACCINE DELIVERY SYSTEMS: USE OF IMMUNOPOTENTIATORS

T 212 OFFICE: AMRDC/SGRD

THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP A VACCINE DELIVERY

FISCAL YEAR 1986

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SYSTEM WHICH WILL STIMULATE, RAPIDLY, A STATE OF NON-SPECIFIC PROTECTION WHILE IT ENHANCES THE SPECIFIC IMMUNE RESPONSE TO THE VACCINE AND SHORTENS THE INDUCTION PERIOD FOR DEVELOPMENT OF SPECIFIC IMMUNITY. THIS WILL BE ACCOMPLISHED BY PREPARING THE VACCINE IN AN OIL-IN-WATER EMULSION THAT CONTAINS NON-TOXIC IMMUNOSTIMULATORS OF MICROBIAL ORIGIN. BOTH SPECIFIC AND NON-SPECIFIC PROTECTION WILL BE TESTED AGAINST A MURINE MODEL OF INFLUENZA VIRUS INFECTION. THE HUMORAL ANTIBODY RESPONSES OF THE MICE WILL ALSO BE FOLLOWED TO ASSESS THE EFFECTIVENESS OF THE DELIVERY SYSTEM. EXPERIMENTAL REGIMENS WILL BE ESTABLISHED TO MEASURE THE CAPACITY OF THE DELIVERY VEHICLE ALONE, WITHOUT THE SPECIFIC VACCINE, TO PROTECT MICE NON-SPECIFICALLY AGAINST AN AEROSOL CHALLENGE OF INFLUENZA VIRUS. THE KINETICS OF THE DEVELOPMENT OF THIS PROTECTION AS WELL AS THOSE FOR THE DEVELOPMENT OF SPECIFIC IMMUNITY WILL ALSO BE ASSESSED. FINALLY, A COMPARISON WILL BE MADE BETWEEN THE MINIMAL AMOUNT OF VACCINE, WITH AND WITHOUT IMMUNOSTIMULATORS, REQUIRED TO ENGENDER SPECIFIC PROTECTION. IT IS ANTICIPATED THAT DATA FROM THESE EXPERIMENTS WILL PROVIDE A FOUNDATION AND A RATIONALE FOR AN EXPANDED PHASE II PROJECT WHICH WILL INCLUDE CLINICAL TRIALS OF THESE AMMUNOSTIMULATORS IN HUMANS.

ROBOCOM SYSTEMS INC 3601 HEMPSTEAD TURNPIKE LEVITTOWN, NY 11756 HERB GOLDMAN TITLE: WAREHOUSE MECHANIZATION OF A NON-MECHANIZED AREA	NAVY	\$ 43,078
T 67	OFFICE: NAVSUP	

THE TECHNICAL OBJECTIVE IS TO PROVIDE A MECHANIZED SYSTEM RATHER THAN A MANUAL OPERATION IN THE NON-MECHANIZED BUILDINGS AND OUTDOOR AREAS. AN ADDITIONAL OBJECTIVE IS TO REDUCE OR ELIMINATE THE PROBLEMS INHERENT TO A "PAPER DRIVEN" WAREHOUSE SYSTEM. A PAPERLESS, RADIO LINKED DATA TERMINAL, WOULD PROVIDE "ON-LINE" INFORMATION WHICH WOULD INCREASE CONTROL AND ELIMINATE THE ERRORS.

ROSENBAUM H ASSOCS INC 111 S BEDFORD ST - STE 101 BURLINGTON, MA 01803 GEORGE A WEBER TITLE: DUST EROSION/DEBRIS SHIELDING EXPERIMENTS	DNA	\$ 49,845
T 2	OFFICE: AM/SBIR	

PREVIOUS GAS GUN EXPERIMENTS HAVE DEMONSTRATED THAT THE EROSION MASS

FISCAL YEAR 1986

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<p>LOSS RATIO CAN EXHIBIT LOW DEPENDENCY ON IMPACT VELOCITY, IF PARTICLE NUMBER DENSITY IS HIGH. IN SEPARATE TESTS, ALUMINUM TARGETS RESPONDED WITH LARGE AREA INCIPIENT PUNCTURE RATHER THAN INTENSE EROSION, WHEN SUBJECTED TO HIGH PARTICLE NUMBER DENSITY ENVIRONMENTS. IN MULTI-BURST CLOUDS OF INTEREST, THESE PHENOMENA OF DEBRIS SHIELDING AND SHOCK-LIKE DAMAGE MAY OCCUR. IN EITHER CASE, NOSETIP MATERIALS, PARTICULARLY SUBTIP DESIGNS, MAY SURVIVE ENVIRONMENTS IN WHICH DUST EROSION MODELS WOULD PREDICT SIGNIFICANT AND UNACCEPTABLE SHARP CHANGE. A SERIES OF LIGHT GAS GUN EXPERIMENTS WILL BE PERFORMED TO EXPLORE THE PHENOMENA OF EROSION/DEBRIS SHIELDING/TARGET SHOCK DAMAGE FOR COMBINATIONS OF VELOCITY AND SIMULATED DUST CLOUD DENSITY.</p>		

S.E.E.S. INC ROUTE 7 BOX 316 LENOIR CITY, TN 37771 R L ANDREWS TITLE: ROBOTICS AND COMPUTER INTEGRATED PRINTING (CIP) T 74 OFFICE: NAVSUP	NAVY	\$ 49,945
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THIS PROPOSAL DESCRIBES METHODS TO AUTOMATE THE PRINTING INDUSTRY THROUGH THE DEVELOPMENT OF ROBOTIC END EFFECTORS, SYSTEMS, AND COMPUTER INTEGRATION. FLEXIBILITY OF ROBOTIC ARMS ARE EXTENDED THROUGH ADVANCED END EFFECTOR DESIGNS BASED ON THE SENSITIVE END EFFECTOR SYSTEM (SEES) CONCEPT. THE SEES HAS PROXIMITY/RANGING, TACTILE, TRACKING, IMAGING, SLIP DETERMINATION AND SLIP CORRECTION CAPABILITIES. COMMUNICATIONS PROTOCOL ARE RESEARCHED WITH EMPHASIS ON MAP, TOP, AND TCP/IP. COMPUTER INTEGRATED MANUFACTURING TECHNIQUES ARE APPLIED TO SPECIFIC PROBLEMS WITHIN THE PRINTING INDUSTRY TO LEAD THEM INTO THE "FACTORY OF THE FUTURE". COMPUTER INTEGRATED PRINTING (CIP) IS THE RESULT.

SACH SINHA & ASSOCS PO BOX 11205 BURBANK, CA 91510 SACH SINHA TITLE: FUZING SYSTEM TO CONTROL DEPTH OF PENETRATION DURING KINETIC DELIVERY OF WEAPONS T 191 OFFICE: BMO/MYSC	AF	\$ 48,690
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THIS IS AN EFFORT TO DESIGN, FABRICATE AND ELECTRONICALLY TEST A

FISCAL YEAR 1986

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<p>BREADBOARD MODEL OF A FUZING SYSTEM WHICH CAN ACCURATELY DETERMINE THE DEPTH OF PENETRATION BY A KINETIC DELIVERY OF WEAPON WARHEAD INTO A HARD TARGET OVER A VARIETY OF IMPACT ANGLES AND BALLISTIC IMPACT. IT IS TARGET PROGRAMMED BEFORE LAUNCH, COMMAND ARMED AND CONTROLS THE WARHEAD BURST POINT AS A FUNCTION OF A PREPROGRAMMED AND TARGET ENVIRONMENTAL INPUTS. THIS DESIGN HAS A UNIQUE FEATURE OF FILTERING TO A GREAT EXTENT THE NOISE IN THE SENSOR OUTPUT DUE TO STRUCTURAL RINGING OF THE PROJECTILE CASING, SENSOR NATURAL FREQUENCY OR VARIATION IN BARRIER DENSITY. DURING THE FIRST PHASE THE UNIT WILL BE SUBJECTED TO SIMULATED IMPACT ENVIRONMENT.</p>		

SAN DIEGO SEMICONDUCTORS INC  
9030 CARROLL WAY - UNIT 8  
SAN DIEGO, CA 92121  
DR EMMANUIL RAISKIN

AF

\$ 47,584

## TITLE:

COMPARATIVE STUDY OF CdTeSe AND CdZnTe SUBSTRATES USING IMPROVED CRYSTAL GROWTH METHODS

T 151

OFFICE: AFWAL/ML

SINGLE CRYSTALLINE SUBSTRATES OF CdTeSe AND CdZnTe, NOMINALLY LATTICE MATCHED TO HgCdTe (205 Cd), WILL BE PREPARED FROM CRYSTALS GROWN BY A NEW PROCESS. THE NEW CRYSTAL GROWTH APPARATUS IS FREE OF QUARTZ AND PROVIDES IMPROVED GROWTH CONDITIONS THROUGH TEMPERATURE PROFILING AND PRESSURE CONTROL METHODS THAT ARE PRECLUDED IN CONVENTIONAL GROWTH SYSTEMS BY HIGH TEMPERATURE AND PRESSURE REQUIREMENTS. IT IS ANTICIPATED THAT SUBSTRATES WITH HIGH PURITY EXCELLENT CRYSTAL MORPHOLOGY AND AREAS GREATER THAN 25 SQ CM WILL BE PRODUCED. CHARACTERIZATION WILL INCLUDE ELECTRON MOBILITY-LIFETIME PROFILING BY ALPHA-PARTICLE EXCITATION, IN ADDITION TO STANDARD MEASUREMENTS. RESULTS OF THE PROGRAM SHOULD 1) ALLOW A CRITICAL COMPARISON TO BE MADE BETWEEN CdTeSe AND CdZnTe SUBSTRATES, 2) PROVIDE SIGNIFICANT NEW INFORMATION RELATED TO LATTICE MATCHING, 3) INCREASING UNDERSTANDING OF THE LATTICE STABILIZING EFFECTS OF ALLOYING, AND 4) DEMONSTRATE THAT IMPROVED QUALITY SUBSTRATES OF CdTe TYPE MATERIALS CAN BE ACHIEVED WITH A NEW CRYSTAL GROWTH METHOD.

SAN DIEGO SEMICONDUCTORS INC  
9030 CARROLL WY - UNIT 8  
SAN DIEGO, CA 92121  
DR EMMANUIL RAISKIN

ARMY

\$ 51,991

## TITLE:

ACHIEVEMENT OF HIGH QUALITY CdZnTe SUBSTRATES USING AN IMPROVED CRYSTAL GROWTH PROCESS

T 65

OFFICE: CECOM/AMSEL

MONOCRYSTALLINE SUBSTRATE OF CdZnTe (4 AT% Zn), NOMINALLY LATTICE

FISCAL YEAR 1986

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MATCHED TO HgCdTe (20 AT% Cd), WILL BE PREPARED FROM CRYSTALS GROWN BY A NEW PROCESS. THE NEW CRYSTAL GROWTH SYSTEM IS FREE OF QUARTZ AND PROVIDES IMPROVED GROWTH CONDITIONS THROUGH 1) TEMPERATURE PROFILING AND PRESSURE CONTROL TECHNIQUES THAT CANNOT BE USED IN CONVENTIONAL GROWTH SYSTEMS BECAUSE OF TEMPERATURE AND PRESSURE LIMITATIONS ON QUARTZ AND 2) REMOVAL OF CONTAMINATION PROBLEMS RELATED TO QUARTZ. IT IS EXPECTED THAT SUBSTRATES OF HIGH PURITY, EXCELLENT CRYSTAL MORPHOLOGY AND AREAS GREATER THAN 25 cm WILL BE PRODUCED. CHARACTERIZATION WILL INCLUDE ELECTRON MOBILITY-LIFETIME PROFILING BY ALPHA-PARTICLE EXCITATION, IN ADDITION TO STANDARD MEASUREMENTS. RESULTS OF THE PROGRAM SHOULD DEMONSTRATE THE IMPORTANCE OF A NEW CRYSTAL GROWTH METHOD IN PREPARING HIGH QUALITY SUBSTRATES OF CdTe TYPE MATERIALS, PROVIDE SIGNIFICANT NEW INFORMATION RELATED TO LATTICE MATCHING, AND INCREASE UNDERSTANDING OF THE LATTICE STABILIZING EFFECTS OF ALLOYING.

SAN DIEGO SEMICONDUCTORS INC  
9030 CARROLL WY - #8  
SAN DIEGO, CA 92121  
DR EMMANUIL RAISKIN

ARMY

\$ 51,366

## TITLE:

IMPROVED PERFORMANCE CdTe NUCLEAR PARTICLE DETECTORS  
T 72 OFFICE: CECOM/AMSEL

CdTe NUCLEAR PARTICLE DETECTORS WILL BE MADE FROM CRYSTALS GROWN BY A NEW PROCESS THAT USES A QUARTZ-FREE SYSTEM PROVIDING IMPROVED GROWTH CONDITIONS THROUGH 1) TEMPERATURE PROFILING AND PRESSURE CONTROL TECHNIQUES THAT CANNOT BE USED IN CONVENTIONAL GROWTH SYSTEMS BECAUSE OF TEMPERATURE AND PRESSURE LIMITATIONS ON QUARTS AND 2) REMOVAL OF A NUMBER OF SIGNIFICANT CONTAMINATION PROBLEMS RELATED TO THE USE OF QUARTZ. IT IS EXPECTED THAT THE IMPROVED QUALITY OF MATERIAL WILL RESULT IN A SUBSTANTIAL IMPROVEMENT IN DETECTOR PERFORMANCE. DETECTORS WILL BE DESIGNED FOR COUNTING APPLICATIONS OF BACKGROUND LEVEL, WITH A BIAS OF 10 VOLTS OR LESS, AND WILL BE SUPPLIED IN A PACKAGE WITH MATCHED PREAMPLIFIERS. PREAMPLIFIER DESIGN WILL BE CONSISTENT WITH EVENTUAL MINIATURIZATION. THE DETECTORS ARE EXPECTED TO HAVE HIGH SURVIVABILITY, WITH A 10% OR LESS PERFORMANCE LOSS AFTER A 2,000 RAD NEUTRON OR GAMMA DOSE. PHASE I WILL BE THE FOUNDATION FOR AN OVERALL PROGRAM WHOSE GOAL IS A PRODUCTION CAPABILITY FOR A COMPACT MONITORING INSTRUMENT, IN WHICH THE DETECTOR UNIT COST WILL BE LESS THAN \$50.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
SATCON TECHNOLOGY CORP 71 ROGERS ST CAMBRIDGE, MA 02142 JAMES R DOWNER TITLE: POWER PLANT AND STORAGE SYSTEM FOR AN ELECTROMAGNETIC AIRCRAFT LAUNCHER T 161            OFFICE: NAVAIR/NAEC	NAVY	\$ 49,915

A NEED EXISTS TO DEVELOP A RELIABLE, COST EFFECTIVE POWER PLANT AND STORAGE SYSTEM FOR AN ELECTROMAGNETIC AIRCRAFT LAUNCHER. THIS SYSTEM CAN BEST BE DEVELOPED AROUND A HIGH ENERGY DENSITY FLYWHEEL COUPLED TO AN ADVANCED ELECTRIC GENERATOR. CONVENTIONAL POWER GENERATION CONCEPTS WOULD BE USED TO CHARGE THE FLYWHEEL BETWEEN LAUNCHES. THE CONTRACTOR WILL REVIEW THE CURRENT STATE-OF-THE-ART IN THE KEY TECHNOLOGY AREAS SUCH AS ROTORS, BEARINGS, ELECTRIC GENERATORS, TRANSMISSIONS AND PRIME MOVERS. A NUMBER OF "STRAWMAN" CONFIGURATIONS WILL BE DEVELOPED AND EVALUATED BASED ON THE CURRENT STATE OF THE APPLICABLE COMPONENT TECHNOLOGIES. THIS EVALUATION WILL BE USED TO SELECT A BASELINE SYSTEM WHICH REPRESENTS THE BEST CANDIDATE FOR DEVELOPMENT, CONSTRUCTION, AND TEST. THE BASELINE SYSTEM WILL BE ANALYZED IN DETAIL INCLUDING COMPONENT PERFORMANCE TRADEOFFS AND IDENTIFICATION OF TECHNOLOGY SHORTFALLS (IF ANY EXIST). AT THE END OF THE PHASE I EFFORT, THE TECHNICAL FEASIBILITY OF THE CONCEPT WILL BE VERIFIED AND A BASELINE DESIGN DEFINITION SUFFICIENT TO ALLOW INITIATION OF A DETAILED DESIGN PHASE WILL EXIST. PRELIMINARY CALCULATIONS INDICATE THAT THE CONCEPT IS BOTH FEASIBLE AND THAT IT CAN EASILY EXCEED THE DESIRED PERFORMANCE GOALS.

SATCON TECHNOLOGY CORP. 71 ROGERS ST. CAMBRIDGE, MA 02142 BRUCE G. JOHNSON TITLE: ACTIVE MAGNETIC VIBRATION ISOLATION T 1            OFFICE:	SDIO	\$ 49,720
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MANY PRECISION POINTING AND TRACKING SYSTEMS OPERATE IN VIBRATION ENVIRONMENTS THAT REQUIRE VIBRATION ISOLATION TO CHIEVE DESIRED

FISCAL YEAR 1986

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PERFORMANCE. ACTIVE VIBRATION ISOLATION SYSTEMS UTILIZING HIGH-FORCE CAPABILITY, NONLINEAR MAGNETIC ACTUATORS ARE A PROMISING MEANS OF ACHIEVING THE REQUIRED HIGH PERFORMANCE VIBRATION ISOLATION. THEIR DESIRABLE CHARACTERISTIC INCLUDE HIGH BANDWIDTH, HIGH-FORCE CAPABILITY, STABILITY, HIGH EFFICIENCY, MULTI-AXIS CAPABILITY, AND EASE OF INTEGRATION WITH ELECTRONIC CONTROL SYSTEMS. THE KEY AREAS OF RESEARCH INVOLVE THE INHERENTLY NONLINEAR NATURE OF THE HIGH-FORCE CAPABILITY ELECTROMAGNETIC ACTUATORS, BECAUSE THE NONLINEARITIES INCREASE THE COMPLEXITY OF MODELLING, ESTIMATING, AND CONTROLLING THE PLANT. THE DESIGN OF THE CONTROLLER, INCLUDING AN ESTIMATOR, IS ESSENTIAL FOR ACHIEVING THE PERFORMANCE REQUIREMENTS FOR ELECTROMAGNETIC VIBRATION ISOLATION SYSTEMS. RESEARCH TO DEVELOP THIS TECHNOLOGY FOR A SINGLE-DEGREE-OF-FREEDOM SYSTEM HAS BEEN INITIATED AS JOINT PROGRAM WITH SATCON AND MIT PERSONNEL. THE PROPOSED PROGRAM WOULD EXPAND THIS RESEARCH AND TO A SYSTEM WITH SIX-DEGREES-OF-FREEDOM.

SATCON TECHNOLOGY CORP.

SDIO

\$ 49,915

71 ROGERS ST.

CAMBRIDGE, MA 02142

BRUCE G. JOHNSON

TITLE:

PULSE POWER INERTIAL ENERGY STORAGE SYSTEM

T 5 OFFICE:

A NEED EXISTS TO DEVELOP AN ENERGY STORAGE SYSTEM FOR SDIO PULSE POWER APPLICATIONS WHICH EXCEEDS THE CAPABILITIES OF EXISTING SYSTEMS SUCH AS CAPACITORS AND BATTERIES. RELIABLE SYSTEMS WHICH CAN PROVIDE BURSTS OF POWER AT THE 10'S OF MW LEVEL ARE NEEDED. NEW DEVELOPMENTS IN COMPOSITE ROTORS, MAGNETIC BEARINGS, MOTOR GENERATORS, AND CONTROL ELECTRONICS HAVE GIVEN INERTIAL ENERGY STORAGE (FLYWHEELS) THE CAPABILITY TO MEET OR EXCEED THESE GOALS. THE ABILITY TO COMBINE HIGH PERFORMANCE COMPOSITE ROTORS WITH MAGNETIC BEARINGS ALLOWS DIRECT CONTROL OF ROTOR DYNAMICS, REDUCES VIBRATION, AND ALLOWS DIRECT CONTROL OF ROTOR DYNAMICS, REDUCES VIBRATION, AND ALLOWS MINIMUM FRICTION. THE CONTRACTOR WILL REVIEW THE STATE-OF-THE-ART IN ALL KEY TECHNOLOGY AREAS. A NUMBER OF STRAWMAN CONFIGURATIONS WILL BE DEVELOPED AND EVALUATED BASED ON THE CURRENT STATE OF THE APPLICABLE COMPONENT TECHNOLOGY SHORTFALLS. AT THE END OF PHASE I THE TECHNICAL FEASIBILITY OF THE CONCEPT WILL BE VERIFIED AND A DETAIL DESIGN COULD BE INITIATED IN PHASE II.



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
SAXPY COMPUTER CORP 255 SAN GERONIMO WY SUNNYVALE, CA 94086 B FRUEDKABDER TITLE: PERFORMANCE ANALYSIS OF MULTI-FRAME DETECTION ALGORITHMS T 225 OFFICE: BMO/MYSC	AF	\$ 49,874

MOST EXISTING DETECTION ALGORITHMS ARE "SINGLE FRAME" TECHNIQUES: THE IR OR RADAR SENSOR PROVIDES A SINGLE IMAGE OF THE AREA UNDER SURVEILLANCE; THIS IMAGE IS THEN PROCESSED TO DETECT THE PRESENCE OF TARGETS. THESE TECHNIQUES OFTEN FAIL TO PERFORM ADEQUATELY IN A DENSE TARGET ENVIRONMENT. IN THIS PROPOSAL WE OUTLINE A DIFFERENT APPROACH BASED ON USING MULTIPLE FRAMES TO PERFORM DETECTION. IN PHASE I WE WILL STUDY THE PERFORMANCE IMPROVEMENT ACHIEVABLE BY THE MULTI-FRAME DETECTOR, COMPARED TO MORE CONVENTIONAL DETECTION TECHNIQUES, AND DEMONSTRATE ITS FEASIBILITY. IN PHASE II WE WILL DEVELOP PRACTICAL IMPLEMENTATIONS OF THE MULTI-FRAME DETECTOR.

SCHAFER W J ASSOCS INC CORPORATE PL 128 - BLDG 2/STE 300 WAKEFIELD, MA 01880 RAYMOND B SCHAEFER TITLE: SURFACE DISCHARGE PRE-IONIZED CO2 LASER T 21 OFFICE: DARPA	DARPA	\$ 54,144
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THIS PROPOSAL IS TO EXPERIMENTALLY INVESTIGATE THE SURFACE DISCHARGE TO PREIONIZED PULSED CARBON DIOXIDE LASERS. IN THIS APPROACH DIELECTRIC ELECTRODES ARE EMPLOYED FOR THE MAIN DISCHARGE, AND A SURFACE DISCHARGE ALONG THE SURFACE OF A DIELECTRIC ELECTRODE PREIONIZES THE GAS VOLUME PRIOR TO THE PRIMARY DISCHARGE. THIS SURFACE DISCHARGE APPROACH ELIMINATES THE NEED FOR A SEPARATE PREIONIZATION SOURCE. A COMMON APPROACH CURRENTLY USED EMPLOYS A SPARKBOARD LOCATED WITHIN AND/OR BEHIND ONE OF THE PRIMARY ELECTRODES. THIS REQUIRES EITHER AN OPEN AREA OR PERFORATION OF A PRIMARY ELECTRODE AND SEPARATES THE ULTRAVIOLET PERIONIZATION SOURCE FROM THE LASER GAS VOLUME. THE PROPOSED APPROACH BOTH ELIMINATES THE NEED FOR OPEN SPACES IN A PRIMARY ELECTRODE, AND LOCATES THE PREIONIZATION SOURCE

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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ADJACENT TO THE LASER VOLUME. IN ADDITION THE USE OF DIELECTRIC ELECTRODES INCREASES THE ARCING LIMITS OF THE PRIMARY DISCHARGE THEREBY ALLOWING LARGER DEPOSITION ENERGY PER UNIT VOLUME. THE SURFACE DISCHARGE PREIONIZATION APPROACH WILL BE EXPERIMENTALLY INVESTIGATED APPLYING THE SURFACE DISCHARGE TECHNOLOGY BASE DEVELOPED IN A WJSA LABORATORY, TO AN EXISTING SINGLE PULSE CARBON DIOXIDE LASER DESIGNED AND FABRICATED IN THE WJSA LABORATORY.

SCHAFFER W J ASSOCS INC  
CORPORATE PL 128 - BLDG 2/STE 300  
WAKEFIELD, MA 01880  
DOUGLAS YOUMANS

DARPA \$ 58,760

## TITLE:

CO2 WAVEGUIDE LASER ARRAY DISCHARGE TECHNOLOGY

T 21 OFFICE: DARPA

WAVEGUIDE CO(2) LASERS HAVE FOUND MANY TACTICAL DOD APPLICATIONS RECENTLY. THE OUTPUT POWER OF A SINGLE WAVEGUIDE CO(2) LASER IS LIMITED TO ABOUT 40 W c.w. DUE TO GAIN SATURATION AND WAVEFRONT ABERRATIONS. IN THE SAME SIZE PACKAGE AN ARRAY OF WAVEGUIDES COULD BE EXCITED POTENTIALLY PRODUCING AN  $m \times n$  INCREASE IN THE TOTAL OUTPUT POWER AND, IF THEY WERE PHASE-LOCKED, POTENTIALLY ALMOST AN  $(m \times n)^2$  INCREASE THE PEAK OF THE FAR-FIELD IRRADIANCE DISTRIBUTION. WJSA HAS FABRICATED  $1 \times 7$  AND  $2 \times 3$  ARRAY DEVICES USING DC LONGITUDINAL EXCITATION. IN ORDER TO ACHIEVE PHASE-LOCKING BETWEEN ADJACENT LASERS, A TRANSPARENT WINDOW OF ZnSe SEPARATES THE WAVEGUIDES. BECAUSE THESE WINDOWS ARE OPTICALLY FLAT, THEY ARE FABRICATED IN SMALL SIZES THUS LEAVING TINY GAPS BETWEEN WAVEGUIDES. THIS RESULTS IN CONSIDERABLE DISCHARGE CROSS TALK AND CONSIDERABLY REDUCED LASER POWER WITH PLASMA OSCILLATIONS. WJSA PROPOSES TO CONVERT THESE EXISTING WAVEGUIDE LASER ARRAYS TO TRANSVERSE RF EXCITATION USING AN EXISTING RF SUPPLY. TRANSVERSE RF EXCITATION WILL ALLOW OPTIMUM GAS POWER LOADING OVER THE ENTIRE WAVEGUIDE LENGTH AND CONSIDERABLY REDUCE THE WAVEGUIDE DISCHARGE CROSSTALK. THE OUTPUT POWERS OF THE INDIVIDUAL WAVEGUIDES SHOULD REMAIN STEADY INSTEAD OF OSCILLATING WILDLY OR EXTINGUISHING WHEN MORE THAN ONE DISCHARGE IS RUN. THE OUTPUT POWER UNIFORMITY OF BOTH ARRAYS WILL BE MEASURED AND THE FAR-FIELD PATTERNS WILL BE EXAMINED FOR PHASE-LOCKING AND ARRAY MODE FORMATION.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
SCHULTZ R E 4520-A AVE H AUSTIN, TX 78751 RICHARD E SCHULTZ TITLE: FAST SIX DEGREE OF FREEDOM OBJECT RECOGNITION ALGORITHM T 213 OFFICE: BMO/MVSC	AF	\$ 23,070

PROJECT GOAL WILL BE TO DEVELOP A FAST ALGORITHM FOR VISUAL RECOGNITION OF OBJECTS IN LOW CONTRAST LIGHTING, PARTIAL VIEW AND SIX DEGREES OF FREEDOM. THE ALGORITHM WILL BE OF THE LOCAL FEATURE FOCUS TYPE. TO DEVELOP THE ALGORITHM I WILL NEED TO ACHIEVE THE FOLLOWING OBJECTIVES: 1. RULES FOR SELECTING IMAGE FEATURE CLUSTERS, 2. RULES FOR IMAGE FEATURE CLUSTER PARAMETER EXTRACTION, 3. MATCH TEST TECHNIQUE TO DETERMINE IF AN IMAGE CLUSTER IS A PROJECTION OF AN OBJECT CLUSTER AND IF SO, THE RELATIVE ORIENTATION BETWEEN IMAGE CLUSTER AND OBJECT CLUSTER, 4. TABLE LOOKUP TECHNIQUE TO REDUCE THE NUMBER OF MATCH TESTS AND, 5. IMAGE CLUSTER PROPERTY TABLE GENERATION PROGRAM.

SCHWARTZ ELECTO-OPTICS INC 45 WINTHROP ST CONCORD, MA 01742 DR PETER F MOULTON TITLE: COHERENT SUMMATION OF Nd:YAG LASERS T 19 OFFICE: DARPA	DARPA	\$ 48,812
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IN THE PROGRAM PROPOSED HERE WE INTEND TO DEMONSTRATE COHERENT BEAM ADDITION OF TWO SINGLE-AXIAL-MODE Nd LASERS OPERATING AT 1.06 MICRONS. THE SIGNIFICANCE OF THIS WORK IS THE DEMONSTRATION OF PHASE-LOCKING EMPLOYING A WELL-DEVELOPED SOLID-STATE LASER MATERIAL, WHICH HAS BEEN USED EXTENSIVELY AS A CW SOURCE AT 1 MICRON. MILITARY APPLICATIONS OF THIS TECHNOLOGY TO ADVANCED RANGING, TRACKING AND ACTIVE-IMAGING SYSTEMS ARE SIGNIFICANT, GIVEN THE HIGHLY SOPHISTICATED COHERENT DETECTION SYSTEMS THAT CAN BE DEVELOPED ONCE A RELIABLE, HIGH POWER, SINGLE-FREQUENCY CW LASER SOURCE IS AVAILABLE AT A 1 MICRON WAVELENGTH.

SCHWARTZ ELECTRO-OPTICS INC 3404 N ORANGE BLOSSOM TRAIL ORLANDO, FL 32804 R J WANGLER TITLE: ROBOTIC RANGING SYSTEM FOR COLLISION AVOIDANCE T 65 OFFICE: NAVSEA	NAVY	\$ 49,806
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THE PROPOSED EFFORT IS TO ANALYZE, DESIGN AND CONSTRUCT AN OPTICAL

FISCAL YEAR 1986

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RANGING SYSTEM TO BE USED AS A COLLISION AVOIDANCE SENSOR. WHILE LASER RANGERS HAVE BEEN USED BY THE INDUSTRIAL AND MILITARY COMMUNITIES FOR MANY YEARS, THESE DESIGNS ARE FOR APPLICATION DIFFERENT FROM THE COLLISION AVOIDANCE AND THEREFORE MORE COMPLEX AND EXPENSIVE. THE PROPOSED DESIGN USES A GaAs LASER DIODE WHICH IS CAPABLE OF VERY SHORT OPTICAL PULSES AT A PULSE RATE SO THAT THE POWER CONSUMPTION IS LOW. THE PROPOSED SYSTEM IS SCANNED IN ONE AXIS SO THAT THE SPACE IN FRONT OF THE ROBOT IS SAMPLED AT MANY DIFFERENT BEARING ANGLES. THE SYSTEM COULD EASILY BE EXPANDED IN THE FUTURE TO SCAN IN BOTH THE AXIMUTH AND ELEVATION. THE VERY NARROW BEAM AND NARROW PULSEWIDTH OF THE LASER RANGER WILL PROVIDE GOOD OBSTACLE DEFINITION. THE PROPOSED RANGER USES A SIMPLE ANALOG TECHNIQUE FOR MEASURING RANGE WHICH YIELDS HIGH ACCURACY AND ELIMINATES THE ULTRA HIGH FREQUENCY DIGITAL COUNTERS AND CIRCUITRY WHICH ARE COMPLEX AND CONSUMES MORE POWER. THE USE OF OPTICAL FIBER DELAY LINES WILL ALLOW THE SYSTEM TO MEASURE TO ZERO RANGE AND ELIMINATE THE ELECTRICAL INTERFERENCE BETWEEN THE TRANSMITTER MAIN BANG AND THE SENSITIVE OPTICAL RECEIVER.

SCHWARTZ ELECTRO-OPTICS INC 45 WINTHROP ST CONCORD, MA 01742 DR PETER F MOULTON TITLE: PROPERTIES OF TRIVALENT TITANIUM IN MAGNESIUM ALUMNIATE T 66 OFFICE: CECOM/ARMY	ARMY	\$ 49,657
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THE PROGRAM PROPOSED HERE WILL STUDY THE PROPERTIES OF A POTENTIAL NEAR-INFRARED-WAVELENGTH, TUNABLE SOLID STATE LASER. THE ACTIVE ION, TRIVALENT TITANIUM, HAS PREVIOUSLY DEMONSTRATED BROADLY TUNABLE OPERATION IN THE HOST CRYSTAL SAPPHIRE, BUT IS CHARACTERIZED BY AN UPPER-STATE LIFETIME TOO SHORT FOR PUMPING BY CONVENTIONAL FLASH-LAMPS. IT MAY BE POSSIBLE TO OBTAIN A LONGER LIFETIME FROM TITANIUM IN ANOTHER HOST, MAGNESIUM ALUMINATE. SPECTROSCOPIC MEASUREMENTS ON CRYSTALS OF TITANIUM-DOPED MAGNESIUM ALUMINATE WILL BE PERFORMED, AND THE POTENTIAL FOR OBTAINING BROADLY TUNABLE, EFFICIENT, LAMP-PUMPED OPERATION WILL BE ASSESSED BASED ON THE MEASUREMENTS.

SCHWARTZ ELECTRO-OPTICS INC 45 WINTHROP ST CONCORD, MA 01742 DR PETER F MOULTON TITLE: CHARACTERIZATION OF Er:Cr:GSGG T 13 OFFICE: AFOSR/XOT	AF	\$ 48,138
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RECENT STUDIES TO IMPROVE THE EFFICIENCY OF LAMP-PUMPED SOLID STATE

FISCAL YEAR 1986

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LASERS HAVE SHOWN THAT CHROMIUM (Cr) SENSITIZATION OF THE NEODYMIUM (Nd) ION IS EFFECTIVE IN THE HOST CRYSTAL GADOLINIUM SCANDIUM GALLIUM GARNET (GSGG). IN THIS PROPOSAL A STUDY WILL BE MADE OF THE CR-SENSITIZATION OF ANOTHER RARE-EARTH ION, ERBIUM (Er). BASIC SPECTROSCOPIC MEASUREMENTS ON A CRYSTAL OF Er:Cr:GSGG WOULD BE PERFORMED TO DERIVE THE ENERGY-LEVELS OF THE Er ION AS WELL AS THE TRANSFER PARAMETERS FOR THE Cr-Er ENERGY EXCHANGE PROCESS. LASER EXPERIMENTS WOULD ALSO BE CARRIED OUT IF THE AVAILABLE CRYSTAL WAS OF SUFFICIENT QUALITY. THE OPERATING EFFICIENCY OF TWO Er TRANSITIONS, AT 1600 AND 2900 NM COULD BE SUBSTANTIALLY IMPROVED IF Cr SENSITIZATION PROVED TO BE SIGNIFICANT.

SCIENCE & ENGINEERING ASSOCS INC 701 DEXTER AVE N - STE 400 SEATTLE, WA 98109 WILLIAM S RIIPPI TITLE: CREW ESCAPE CAPSULE TO AIRFRAME LATCH/DISCONNECT MECHANISMS T 137 OFFICE: AFWAL/FI	AF	\$ 46,889
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STRUCTURAL LATCH MECHANISM CONCEPTS WILL BE DEVELOPED TO BE USED ON FUTURE FIGHTER AIRCRAFT FOR INTERFACING THE CREW ESCAPE CAPSULE WITH THE AIRFRAME. THE F-111 ESCAPE CAPSULE DESIGN WILL AID IN THE GENERATION AND VALIDATION OF PRELIMINARY DESIGN REQUIREMENTS. THREE PHILOSOPHIES WILL BE CONSIDERED IN DEVELOPING THE DESIGN CONCEPTS. ONE WILL MAXIMIZE THE LOAD DISTRIBUTION BETWEEN THE TWO STRUCTURES. ANOTHER WILL CONSIDER THE CAPSULE AND AIRFRAME AS INDEPENDENT STRUCTURES AND LIMIT THE LOAD DISTRIBUTION TO THREE PIN JOINTS. THE THIRD PHILOSOPHY WILL ATTEMPT TO INCORPORATE THE POSITIVE ATTRIBUTES OF THE OTHER TWO CASES. EVALUATION OF CONCEPTS THROUGH TRADE STUDY ANALYSIS WILL BE CONDUCTED, LEADING TO IDENTIFICATION AND REFINEMENT OF THE PREFERRED CONCEPTUAL DESIGNS. A FEASIBILITY STUDY WILL BE PERFORMED ON THE INDIVIDUAL MECHANISMS, AS WELL AS THEIR INTEGRATION INTO A CREW ESCAPE MECHANISM SYSTEM. THE FINAL REPORT WILL INCLUDE LATCH MECHANISM TECHNICAL REQUIREMENTS, ENGINEERING LAYOUTS, ANALYSES, AND FEASIBILITY STUDY AND RATIONALE.

SCIENCE & ENGINEERING ASSOCS INC PO BOX 3722 ALBUQUERQUE, NM 87109 DR R O RANTANEN TITLE: GROUND MOBILE TARGET DISCRIMINATION T 224 OFFICE: BMO/MYSC	AF	\$ 48,910
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THIS STUDY UTILIZES THE EXPERIENCE GAINED ON MPS, CSB, D2B PEACE-

FISCAL YEAR 1986

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AMOUNT

KEEPER CONCEALMENT BASING STUDIES AND RECENT SMALL MISSILE CONCEALMENT STUDIES. SENSORS, DISCRIMINANTS AND PHYSICAL SIGNATURES APPLICABLE TO AN ICBM IN CONJUNCTION WITH A TRANSPORTER/LAUNCHER ARE SCREENED FOR APPLICABILITY TO BALLISTIC MISSILE DELIVERY SYSTEM SENSOR PLATFORMS. THREE VARIATIONS OF SENSOR PLATFORMS ARE EVALUATED AGAINST THE GROUND MOBILE TARGET WHILE PARKED AND MOBILE, IN FOR-RESTED AND OPEN TERRAIN, WITH THE MISSILE ECS, MGCS BOTH POWERED UP AND DORMANT. THIS COMBINATION OF PARAMETERS/SCENARIOS WILL YIELD A FEASIBILITY ASSESSMENT FOR SUCH SYSTEMS AND WILL DETERMINE A COUNTER-MEASURE POTENTIAL FOR THOSE SENSOR, SIGNATURE, DISCRIMINANT COMBINATIONS THAT SURVIVE VARIOUS LEVELS OF SCREENING.

SCIENCE &amp; ENGINEERING ASSOCS INC

DNA

\$ 49,900

PO BOX 3722

ALBUQUERQUE, NM 87190

PAUL B FLEMING

TITLE:

IDENTIFICATION OF NWE H/S MILITARILY CRITICAL TECHNOLOGY

T

5

OFFICE: AM/SBIR

SOVIET ACQUISITION OF WESTERN TECHNOLOGY CAN BE DIRECTLY TRACED TO IMPROVEMENTS IN THEIR MILITARY CAPABILITY. HARDENING AND SURVIVABILITY TECHNOLOGY IS UNDOUBTEDLY HIGH ON THE ACQUISITION PRIORITY. IMPLEMENTATION OF DOD INSTRUCTION DODI 4245.4 - ACQUISITION OF NUCLEAR SURVIVABLE SYSTEMS WILL RESULT IN THE EXTENDED USE OF NUCLEAR WEAPON EFFECTS HARDENING AND SIMULATION TECHNOLOGY THROUGHOUT THE GOVERNMENT. NEW TECHNOLOGY FOR NWE H/S WILL BE DEVELOPED BY GOVERNMENT ACTIVITIES AND BY PRIVATE INDUSTRY. THE MAJORITY OF THE NWE H/S TECHNOLOGY BASE RESULTS FROM EXTENSIVE RDT&E PROGRAM INVESTMENTS AND CONTAINS SOPHISTICATED INNOVATIVE SOLUTIONS WHICH PROVIDE THE U.S. WITH SIGNIFICANT MILITARY ADVANTAGES. EXTENSIVE PORTIONS OF THIS TECHNOLOGY IS UNCLASSIFIED AND SHOULD BE PROTECTED THROUGH EFFECTIVE CONTROLS TO LIMIT THE SOVIET COLLECTION. THE DEFENSE NUCLEAR AGENCY, BECAUSE OF ITS SUPPORT TO THE ATSD(AE) IN IMPLEMENTATION OF DODI 4245.4 AND ITS DoD LEADERSHIP ROLE IN NWE H/S RDT&E PROGRAMS, IS AN APPROPRIATE DoD ACTIVITY TO DEFINE THE CONTROLS. DURING PHASE ONE, THE ADEQUACY OF THE EXPORT CONTROL GUIDANCE IN THE MILITARILY CRITICAL TECHNOLOGY LIST FOR NWE H/S TECHNOLOGY WILL BE EXAMINED AND METHODOLOGIES DEFINED TO PRODUCE A DETAILED STRUCTURED TECHNOLOGY STATEMENT OF THE EXPORT CONTROL REQUIREMENTS FOR THIS CRITICAL MILITARY TECHNOLOGY.

FISCAL YEAR 1986

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SCIENCE & ENGINEERING ASSOCS INC 2500 LOUISIANA NE - STE 505 ALBUQUERQUE, NM 87110 DR W R SEEBAUGH TITLE: AN INNOVATIVE APPROACH TO INTERACTIVE NUCLEAR CLOUD MODELING T 1 OFFICE: AM/SBIR	DNA	\$ 47,404

THEORETICAL COMPUTER CODES FOR ANALYSIS OF NUCLEAR DUST/DEBRIS CLOUDS CURRENTLY OVER-ESTIMATE THE DEGREE OF INTERACTION BETWEEN THE CRATER EJECTA AND THE FIREBALL BY FACTOR OF THREE OR MORE FOR NEAR-SURFACE BURSTS. MOST OF THE COLD EJECTA REMAINS CLOSE TO THE SURFACE IN A COHERENT SHEET AND DOES NOT INTERACT WITH THE HOT FIREBALL GASES. AS A RESULT, THE INITIAL COOLING OF THE FIREBALL BY THE COLD EJECTA PRE-DICTED BY THE CODES MAY NOT OCCUR, POSSIBLE RESULTING IN SIGNIFICANT ERRORS IN THE RATE OF RISE OF THE DUST/DEBRIS CLOUD. THE FORM OF AN ALGORITHM FOR DETERMINING THE EJECTA-FIREBALL INTERACTION FRACTION FOR A CRATERING BURST WILL BE DEVELOPED BY ANALYSIS OF EXPERIMENTAL CRATER DATA AND CALCULATED EJECTA DISTRIBUTIONS. THE ALGORITHM WILL BE IN A FORM WITH UNSPECIFIED COEFFICIENTS THAT CAN BE DETERMINED (DURING PHASE II) FROM PAST AND FUTURE EXPERIMENTAL MEASUREMENTS AND THEORETICAL CALCULATIONS FOR ARBITRARY COMBINATIONS OF YIELD, EXPLOSIVE TYPE, CHARGE GEOMETRY, HEIGHT/DEPTH OF BURST, AND GEOLOGIC MEDIUM. THE ALGORITHM WILL BE CAPABLE OF INDEPENDENT APPLICATION FOR USE WITH EXISTING DATA OR CODE RESULTS, AND ALSO AS A POST PROCESSOR FOR USE WITH NEW THEORETICAL CODE CALCULATIONS.

SCIENCE RESEARCH LAB 15 WARD ST SOMERVILLE, MA 02143 JONAH JACOB TITLE: NEW DISCHARGE PUMPING METHOD FOR CO2 LASERS T 21 OFFICE: DARPA	DARPA	\$ 49,773
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A NEW PULSED LASER DISCHARGE CONCEPT IS PROPOSED TO MEET MILITARY AND CIVILIAN REQUIREMENTS FOR EFFICIENT OPERATION OF COMPACT, HIGH ENERGY CO(2) LASERS. THIS DISCHARGE CONCEPT PROMISES PULSE LENGTHS OF UP TO 100 MICROSECONDS DURATION, SCALABILITY TO MULTI-KILOJOULE SINGLE

FISCAL YEAR 1986

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PULSED ENERGY, HIGH VOLUMETRIC EFFICIENCY ( $>$  OR  $=$  50 JOULES/LITER-ATM) AND HIGH ELECTRICAL EFFICIENCY ( $<$  OR  $=$  20%). THIS DISCHARGE CONCEPT RELIES ON A NEW METHOD FOR MAINTAINING DISCHARGE STABILITY FOR LONG PULSE DURATIONS. THIS NEW CO(2) LASER DISCHARGE CONCEPT PROMISES INCREASED EFFICIENCY, REPETITION RATE, PULSE LENGTH, EXTRACTED ENERGY PER UNIT VOLUME AND RELIABILITY. THE OBJECTIVE OF THE PROPOSED PROGRAM IS TO DETERMINE THE FEASIBILITY OF THIS NEW CO(2) LASER DISCHARGE CONCEPT. IN THE PHASE I PROGRAM, THE NEW DISCHARGE CONCEPT WILL BE MODELLED, ANALYTICALLY AND NUMERICALLY, TO DETERMINE ITS STABILITY CHARACTERISTICS AS A FUNCTION OF THE DISCHARGE PARAMETERS (VOLTAGE, CURRENT, ELECTRODE GEOMETRY) FOR TYPICAL PULSED CO(2) LASER GAS MIXTURES AND PRESSURES. IN ADDITION, DURING THE PHASE I EFFORT, CO(2) LASER EXPERIMENTS WILL BE DESIGNED TO TEST THIS NEW DISCHARGE CONCEPT. THESE EXPERIMENTS ARE PROPOSED TO BE CONDUCTED DURING THE PHASE II EFFORT.

SCIENTIFIC RESEARCH ASSOC., INC.

SDIO

\$ 96,603

P.O. BOX 498, 50 NYE RD.

GLASTONBURY, CT 06033

HAROLD L. GRUBIN

TITLE:

VECTORIZED THREE DIMENSIONAL TRANSIENT SEU SIMULATIONS-APPLICATIONS  
TO GALLIUM ARSENIDE FETS

T 7 OFFICE:

SINGLE EVENT UPSETS (SEUS) INDUCED BY IONIZING RADIATION CONSTITUTE ONE OF THE MOST PRESSING PROBLEMS OF SEMICONDUCTOR TECHNOLOGY. AN UNDERSTANDING OF THE PHYSICAL MECHANISMS ASSOCIATED WITH CHARGE COLLECTION HAS ALREADY FURTHERED THE DEVELOPMENT OF HARDENING PROCEDURES. THIS UNDERSTANDING HAS DEVELOPED, IN LARGE PART THROUGH IMPLEMENTATION OF TRANSIENT NUMERICAL SIMULATIONS OF SEUS. HOWEVER, AT PRESENT, THERE EXISTS WITHIN THE UNITED STATES ENGINEERING AND SCIENTIFIC COMMUNITY, A STUMBLING BLOCK TO THE FURTHER DEVELOPMENT OF EFFICIENT METHODS OF HARDENING. THIS STUMBLING BLOCK IS THE ABSENCE OF A THREE DIMENSIONAL ALGORITHM THAT SIMULTANEOUSLY SATISFIES THE FOLLOWING TWO CRITERIA: 1) THE ABILITY TO PERFORM THREE DIMENSIONAL TRANSIENT SIMULATIONS OF SEUS, AND 2) THE CAPABILITY OF PERFORMING THESE SIMULATIONS WITHIN AN ACCEPTABLE TIMEFRAME. THIS CAPABILITY EXISTS IN JAPAN AS A RECENT STUDY INDICATES. THE ENCLOSED PROPOSAL DESCRIBES A PROGRAM FOR VECTORIZING AN EXISTING THREE DIMENSIONAL TRANSIENT ALGORITHM WITH A DEMONSTRATED



FISCAL YEAR 1986

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CAPABILITY OF STUDYING THE TRANSIENT RESPONSE OF SEMICONDUCTORS TO INCIDENT IONIZING RADIATION. VECTORIZATION WILL REDUCE RUN-TIME BY AT LEAST AN ORDER OF MAGNITUDE, THEREBY MAKING THE ALGORITHM OF PRACTICAL SIGNIFICANCE IN THE DEVELOPMENT OF HARDENING PROCEDURES. THE FEASIBILITY OF THE VECTOR THREE DIMENSIONAL TRANSIENT SEU ALGORITHM WILL BE DEMONSTRATED BY STUDYING THE RESPONSE OF A GALLIUM ARSENIDE (GAAS) JUNCTION FIELD EFFECT TRANSISTOR TO INCIDENT IONIZING RADIATION.

SCIENTIFIC RESEARCH ASSOCS INC PO BOX 498 - 50 NYE RD GLASTONBURY, CT 06033 DR HENRY MCDONALD TITLE: ADVANCED GAS TURBINE AUGMENTOR ACOUSTIC CHARACTERIZATION T 177 OFFICE: NAVAIR/NAPC	NAVY	\$ 49,975
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ACOUSTIC RESONANCE CREATES A PROBLEM WITH BOTH THE OPERATION AND THE DURABILITY OF CURRENT HIGH PERFORMANCE GAS TURBINE AUGMENTORS. FUTURE GAS TURBINES ARE EXPECTED TO HAVE AN EVEN MORE SEVERE ENVIRONMENT FOR AUGMENTOR RESONANCE. THE CURRENT LEVEL OF UNDERSTANDING OF THIS PROBLEM GIVES NO ASSURANCE THAT SATISFACTORY PERFORMANCE CAN BE OBTAINED FROM THE MORE ADVANCED AUGMENTORS WITHOUT MAJOR DEVELOPMENT EFFORT. THE PROPOSED PROGRAM WOULD INITIATE A BASIC STUDY OF THE RESONANCE MECHANISMS WHICH WOULD BE OF USE IN THE DESIGN OF PRESENT AND FUTURE AUGMENTORS. IN PHASE I, AN EXPERIMENTAL APPROACH WOULD BE USED WITH PREMIXED GASES STABILIZED ON BLUFF BODY FLAME HOLDERS USING NOZZLES WITH GEOMETRIES OF BROAD SIMILARITY TO THOSE UNDER CURRENT CONSIDERATION TO AUGMENT THRUST AND REDUCE SIGNATURES. THE EMPHASIS ON THE INITIAL MEASUREMENTS WOULD BE ON STATIC PRESSURE CHARACTERISTICS TO IDENTIFY NATURE, FREQUENCY AND AMPLITUDE OF THE OSCILLATION. THE IDENTIFICATION OF THE PARAMETERS INFLUENCING THE TYPE OF OSCILLATION, LOCATION OF NODES, ETC., SHOULD LEAD TO IMPROVE METHODS OF ATTENUATING THE DISTURBANCES, AND THESE WOULD BE INVESTIGATED IN PHASE II.

SCIENTIFIC RESEARCH ASSOCS INC PO BOX 498 GLASTONBURY, CT 06033 HAROLD L GRUBIN TITLE: NUMERICAL SIMULATION OF MAGNETIC LEC GROWTH OF SEMI-INSULATING GaAs T 152 OFFICE: AFWAL/ML	AF	\$ 53,000
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DISLOCATIONS IN SEMI-INSULATING GALLIUM ARSENIDE (GaAs) CRYSTALS ARE

FISCAL YEAR 1986

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KNOWN TO EXERT A CONSIDERABLE INFLUENCE ON THE PERFORMANCE OF ELECTRONIC DEVICES. THE CRYSTAL QUALITY IN TURN DEPENDS ON THE MELT-CRYSTAL INTERFACE CHARACTERISTICS, E.G., TEMPERATURE FLUCTUATION DURING GROWTH. FOR A LONG TIME IT HAS BEEN KNOWN THAT AN EXTERNALLY APPLIED MAGNETIC FIELD CAN MODIFY THE FLUID DYNAMICS OF A CONDUCTING LIQUID. PRESENTLY, SCIENTIFIC RESEARCH ASSOCIATES, INC. (SRA) HAS SUCCESSFULLY DEVELOPED AN EFFICIENT NUMERICAL SCHEME IN CONJUNCTION WITH AN INTERFACE TRACKING ALGORITHM FOR SIMULATION OF CZOCHRALSKI (CZ) GROWTH. IT IS THE INTENT OF THE PROPOSED PROGRAM TO EXTEND SRA'S EXISTING TECHNIQUE TO MAGNETIC LIQUID ENCAPSULATION CZOCHRALSKI GROWTH (MLEC) TO PREDICT INTERFACIAL MELT CHARACTERISTICS. THE ADVANTAGE OF USING THE MLEC METHOD IS THAT THE INHOMOGENIETY OF THE CRYSTAL QUALITY IS CONTROLLABLE. THE PROPOSED PHASE I PROGRAM IS A FEASIBILITY STUDY FOR THE DEVELOPMENT OF PREDICTIVE CAPABILITIES OF CRYSTAL/MELT CHARACTERISTICS. SEMI-INSULATING GaAs WILL BE USED TO DEMONSTRATE THE DEVELOPMENT. A SUCCESSFUL PROGRAM WOULD PROVIDE AN IMPORTANT CONTRIBUTION TO A BETTER UNDERSTANDING OF THE GROWN CRYSTAL INTERFACE.

SCIENTIFIC RESEARCH ASSOCS INC  
PO BOX 498  
GLASTONBURY, CT 06033  
HAROLD L GRUBIN

AF

\$ 52,909

## TITLE:

NUMERICAL SIMULATION OF HIGH SPEED SELECTIVELY DOPED HETERO-  
STRUCTURE FIELD EFFECT TRANSISTORS

T 119

OFFICE: AFWAL/AA

OF ALL THE DEVICES PROPOSED FOR HIGH SPEED OPERATION, THE HIGH ELECTRON MOBILITY TRANSISTOR (HEMT) SEEMS TO BE THE MOST PROMISING ONE. CURRENTLY, THERE IS A NEED TO EVALUATE THE DEVICE PHYSICS AND OPERATING CHARACTERISTICS OF HEMT DEVICES. THIS PROPOSAL ADDRESSED THIS ISSUE BY FOCUSING ON TWO CRITICAL QUESTIONS ON THE DESIGN OF HEMT. FIRST, HOW IS THE PERFORMANCE OF THE DEVICE, ESPECIALLY SWITCHING SPEED, INFLUENCED BY THE SOURCE AND DRAIN DIFFUSIONS? SECOND, WHAT IS THE EFFECT OF THE GATE LENGTH ON DEVICE OPERATION? THE ANSWER TO THESE QUESTIONS ARE SOUGHT IN THIS PROPOSAL VIA NUMERICAL SIMULATION THROUGH SOLUTION TO THE SEMICONDUCTOR DRIFT AND DIFFUSION EQUATIONS. SPECIFICALLY, TO DEMONSTRATE THE FEASIBILITY OF USING NUMERICAL SIMULATION AS A TOOL IN THE DESIGN OF THE HEMT, THE PROPOSAL OUTLINES A PROGRAM TO ASSESS THE OPERATION OF THE HEMT

FISCAL YEAR 1986

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THROUGH CALCULATIONS WITH TWO DIFFERENT GATE LENGTHS AND TWO DIFFERENT SOURCE AND DRAIN DIFFUSIONS DEPTHS.

SCIENTIFIC RESEARCH ASSOCS INC	AF	\$ 52,090
PO BOX 498 - 50 NYE RD		
GLASTONBURY, CT 06033		
HAROLD L GRUBIN		

## TITLE:

NUMERICAL SIMULATION OF BIPOLAR INVERSION CHANNEL FIELD-EFFECT TRANSISTOR (BICFET)

T 120 OFFICE: AFWAL/AA

MAXIMUM SPEED OF OPERATION AND HIGH TRANSCONDUCTANCE OF TRANSISTORS HAVE BEEN AMONG THE DRIVING FORCES TOWARD SUBMICRON MICROMINIATURIZATION WITHIN THE PAST DECADE. ADVANCES TOWARD THESE GOALS HAVE RESULTED IN AN EVER INCREASING SPATE OF NEW DEVICES, AMONG THEM THE HEMT, MODFET, TRANSISTOR, THE PERMEABLE BASE TRANSISTOR, ETC. RECENTLY, A NEW DEVICE HAS BEEN PROPOSED: THE BIPOLAR INVERSION CHANNEL FIELD-EFFECT TRANSISTOR (BICFET) THAT FEATURES VERY HIGH CURRENT OPERATION, VERY HIGH CURRENT GAIN AND, THUS, VERY HIGH TRANSCONDUCTANCE AND LOW INPUT CAPACITANCE. AS PROPOSED, THE BICFET DOES NOT APPEAR TO HAVE THE PUNCH-THROUGH CONSTRAINTS OF THE MOSE OR BIPOLAR TRANSISTORS AND MAY BE SCALED TO LESS THAN 100nm. THE BICFET CONCEPT IS A NEW AND INTERESTING CONCEPT, AND MAY HAVE APPLICABILITY TO A VARIETY OF OTHER DEVICES; BUT THE DETAILS OF THE BICFET OPERATION NEED SIGNIFICANT FURTHER EVALUATION. THE PURPOSE OF THIS PHASE I DOCUMENT IS TO DESCRIBE A PROGRAM FOR INITIATING A THEORETICAL EVALUATION OF THE OPERATIONS PROPERTIES BICFET, THROUGH APPLICATION OF AN EXISTING SEMICONDUCTOR NUMERICAL ALGORITHM. THE GOAL OF THE PROGRAM IS TO ASSIST IN THE DEVELOPMENT OF THE STRUCTURE.

SCIENTIFIC RESEARCH ASSOCS INC	AF	\$ 52,000
PO BOX 498		
GLASTONBURY, CT 06033		
HENRY MCDONALD		

## TITLE:

THREE-DIMENSIONAL COMPRESSOR BLADE ANALYSIS INCLUDING TIP LEAKAGE EFFECTS DEVELOPMENT

T 182 OFFICE: AFWAL/PO

THE PROPOSED EFFORT WOULD DEVELOP AN ANALYSIS FOR THREE-DIMENSIONAL

FISCAL YEAR 1986

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COMPRESSOR PASSAGE FLOW FIELDS INCLUDING TIP LEAKAGE EFFECTS. THE ANALYSIS WOULD BE BASED UPON A HIGH RESOLUTION, THREE-DIMENSIONAL NAVIER-STOKES APPROACH AND WOULD INCLUDE THE EFFECTS OF BLADE AND CASING BOUNDARY LAYERS, PASSAGE SECONDARY FLOW AND TIP CLEARANCE. AT PRESENT, CASCADE TIP FLOW ANALYSES ARE EITHER SEMI-EMPIRICAL OR BASED UPON SETS OF SIMPLIFIED EQUATIONS WHICH NEGLECT SIGNIFICANT PHYSICAL PHENOMENA. THE PROPOSED EFFORT WOULD BE BASED UPON A HIGHLY RESOLVED NUMERICAL SIMULATION USING THE THREE-DIMENSIONAL NAVIER-STOKES EQUATIONS. THIS APPROACH WOULD ALLOW INCLUSION OF THE RELEVANT PHYSICAL PHENOMENA, WOULD BE AN ECONOMICAL AND EFFICIENT METHOD OF ASSESSING FLOW FIELDS, AND WOULD GIVE DETAILED FLOW FIELD DESCRIPTIONS. UNDER THE PHASE I EFFORT, A GENERAL THREE-DIMENSIONAL NAVIER-STOKES CODE WOULD BE APPLIED TO THE TIP FLOW FIELD PROBLEM. A DEMONSTRATION CALCULATION WOULD BE MADE AND INTERROGATE TO ASSESS THE VIABILITY OF THIS APPROACH. FUTURE EFFECTS WOULD ADD FURTHER GEOMETRIC GENERALITY, PERFORM A QUANTITATIVE ASSESSMENT AND DEVELOP A USER-ORIENTED VERSION OF THE CODE.

SCIENTIFIC RESEARCH ASSOCS INC

ARMY

\$ 54,639

PO BOX 498

GLASTONBURY, CT 06033

HOWARD J GIBELING

TITLE:

PROJECTILE BASE BLEED PREDICTION TECHNIQUE DEVELOPMENT

T 151

OFFICE: LABCOM/BRL

THE PROPOSED EFFORT WOULD DEVELOP A PREDICTIVE TECHNIQUE FOR THE PROJECTILE BASE FLOW REGION INCLUDING THE EFFECTS OF BASE INJECTION AND SPIN. THE TECHNIQUE WOULD BE BASED UPON A SOLUTION OF THE NAVIER-STOKES EQUATIONS WITHOUT THE ASSUMPTION OF AXIAL SYMMETRY, AND WOULD BE APPLICABLE FROM THE LOW SUBSONIC MACH NUMBER RANGE THROUGH THE MID-SUPERSONIC RANGE FOR FLOW ABOUT BOTH AXISYMMETRIC AND NON-AXISYMMETRIC BODIES. AT PRESENT MOST TECHNIQUES FOR PREDICTING THE PROJECTILE BASE BLEED FLOW ARE BASED UPON RELATIVELY SIMPLE EMPIRICAL ANALYSES OR ARE DRESTRICTED TO ASSUMED AXISYMMETRIC FLOW. THE APPROACH PROPOSED HEREIN WOULD BE AAN INNOVATIVE TECHNIQUE BASED UPON A HIGH RESOLUTION NAVIER-STOKES STUDY AND, THEREFORE, WOULD SIMULATE THE PHYSICS FROM THE GOVERNING EQUATIONS. UNDER THE PHASE I EFFORT, A GENERAL NAVIER-STOKES CODE WOULD BE APPLIED TO THE PROBLEM AND DEMONSTRATION CALCULATIONS WOULD BE MADE. FUTURE EFFORTS WOULD FOCUS UPON A QUANTITATIVE ASSESSMENT OF THE PROCEDURE OVER A WIDE RANGE OF FLOW CONDITIONS,

FISCAL YEAR 1986

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APPLICATION FOR THREE-DIMENSIONAL FLOW I.E., BODY AT ANGLE OF ATTACK,  
CREATION OF BASE DRAG PERFORMANCE CURVES AND DEVELOPMENT OF A USER-  
FRIENDLY CODE.

SCIENTIFIC RESEARCH ASSOCS INC PO BOX 498 GLASTONBURY, CT 06033 BERNARD C WEINBERG TITLE: A MULTI FREQUENCY JET VENTILATOR FOR USE UNDER BATTLEFIELD CONDITIONS DEVELOPMENT T 214 OFFICE: AMRDC/SGRD	ARMY	\$ 54,161
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THE PROPOSED EFFORT FOCUSES UPON THE DESIGN AND DEVELOPMENT OF AN ULTRA HIGH FREQUENCY JET VENTILATOR THAT COULD BE USED IN CONJUNCTION WITH OTHER PROCEDURES FOR THE TREATMENT OF INJURIES SUSTAINED UNDER BOTH COMBAT AND NONCOMBAT CONDITIONS. THE ULTRA HIGH FREQUENCY JET VENTILATOR IS PORTABLE, I.E. COMPACT, LIGHTWEIGHT AND HAS LOW POWER CONSUMPTION, AND COULD BE OPERATED AND MAINTAINED BY INDIVIDUALS WITH MINIMAL TRAINING. IT CAN OPERATE NOT ONLY IN THE ULTRA-FREQUENCY MODE BUT ALSO AT FREQUENCIES IN THE RANGE EMPLOYED BY CONVENTIONAL POSITIVE PRESSURE VENTILATION. THIS PERMITS ONE TO TUNE THE FREQUENCY TO BEST TREAT THE PATIENT. IN THE ULTRA-HIGH FREQUENCY MODE THE VENTILATOR ACHIEVES ITS MAJOR BENEFITS OVER OTHER FORMS OF VENTILATION BY AUGMENTING MASS TRANSPORT, RATHER THAN CONVECTING GASES IN BULK QUANTITIES. IN THE PROPOSED EFFORT LABORATORY EXPERIMENTS ON PIGS WILL BE CONDUCTED THAT WOULD SIMULATE BATTLEFIELD INJURIES SUCH AS PENETRATING CHEST WOUNDS AND PARALYSIS TO THE THORACIC MUSCLES. COMPARISONS BETWEEN ULTRA-HIGH FREQUENCY AND CONVENTIONAL POSITIVE PRESSURE VENTILATION WOULD BE MADE THEREBY DETERMINING THE EFFICACY OF THE PRESENT FORM OF VENTILATION IN TREATING SUCH TYPES OF INJURIES.

SCIENTIFIC RESEARCH ASSOCS INC PO BOX 498 GLASTONBURY, CT 06033 HAROLD L GRUBIN TITLE: VECTORIZED THREE-DIMENSIONAL SEU SIMULATIONS APPLICATION TO SILICON MOSFETS T 1 OFFICE: AM/SBIR	DNA	\$ 54,724
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SINGLE EVENT UPSETS (SEUs) INDUCED BY IONIZING RADIATION CONSTITUTE

FISCAL YEAR 1986

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ONE OF THE MOST PRESSING PROBLEMS OF SEMICONDUCTOR TECHNOLOGY. AN UNDERSTANDING OF THE PHYSICAL MECHANISMS ASSOCIATED WITH CHARGE COLLECTION HAS ALREADY FURTHERED THE DEVELOPMENT OF HARDENING PROCEDURES. THIS UNDERSTANDING HAS DEVELOPED IN LARGE PART THROUGH IMPLEMENTATION OF TRANSIENT NUMERICAL SIMULATIONS OF SEUs. HOWEVER, AT PRESENT, THERE EXISTS WITHIN THE UNITED STATES ENGINEERING AND SCIENTIFIC COMMUNITY, A STUMBLING BLOCK TO THE FURTHER DEVELOPMENT OF EFFICIENT METHODS OF HARDENING. THIS STUMBLING BLOCK IS THE ABSENCE OF A THREE DIMENSIONAL ALGORITHM THAT SIMULTANEOUSLY SATISFIES THE FOLLOWING TWO CRITERIA: (1) THE ABILITY TO PERFORM THREE DIMENSIONAL TRANSIENT SIMULATIONS OF SEUs, AND (2) THE CAPABILITY OF PERFORMING THESE SIMULATIONS WITHIN AN ACCEPTABLE TIME FRAME. THIS CAPABILITY EXISTS IN JAPAN AS A RECENT STUDY INDICATES. THE ENCLOSED PROPOSAL DESCRIBES A PROGRAM FOR VECTORIZING AN EXISTING THREE-DIMENSIONAL TRANSIENT ALGORITHM WITH A DEMONSTRATED CAPABILITY OF STUDYING THE TRANSIENT RESPONSE OF SEMICONDUCTORS TO INCIDENT IONIZING RADIATION. VECTORIZATION WILL REDUCE RUN TIME BY AT LEAST AN ORDER OF MAGNITUDE, THEREBY MAKING THE ALGORITHM OF PRACTICAL SIGNIFICANCE IN THE DEVELOPMENT OF HARDENING PROCEDURES. THE FEASIBILITY OF THE VECTOR THREE DIMENSIONAL TRANSIENT SEU ALGORITHM WILL BE DEMONSTRATED BY STUDYING THE RESPONSE OF A SILICON MOSFET TO INCIDENT IONIZING RADIATION.

SCIENTIFIC SYSTEMS INC

NAVY

\$ 59,342

35 CAMBRIDGE PARK DR - ONE ALEWIFE PL

CAMBRIDGE, MA 02140

HAMID RAZAVI

TITLE:

COMPUTER BASED DESIGN OF ROBUST CONTROLLER FOR ROBOTIC APPLICATIONS

T 100

OFFICE: NSWC

RECENT RESULTS IN LINEAR MULTIVARIABLE CONTROL BASED ON THE COMBINED STABLE FACTORIZATION AND H INFINITY -OPTIMIZATION METHODOLOGIES (SH/H INFINITY) NOW ALLOW A SYNTHESIS-ORIENTED SYSTEMATIC APPROACH TO ROBUST CONTROLLER DESIGN. THIS POWERFUL NEW APPROACH PROVIDES SOLUTION TO SEVERAL PREVIOUSLY UNSOLVED BUT WIDELY ENCOUNTERED CONTROL DESIGN PROBLEMS. DURING PHASE I OF A THREE PHASE RESEARCH PROGRAM IT IS PROPOSED THAT FURTHER ALGORITHMIC AND THEORETICAL RESULTS IN SF/H INFINITY BE EVOLVED AND APPLIED TO THE CONTROL OF A FLEXIBLE ROBOT. THE PHASE I EFFORT CONSISTS OF FIVE MAJOR TASKS WHICH ADDRESS REPRESENTATIONS OF MODEL UNCERTAINTY, COMPUTATION OF H INFINITY -OPTIMAL CONTROLLERS, MODEL REDUCTION IN CONTROL DESIGN ROBUST PERFORMANCE,

FISCAL YEAR 1986

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FAULT TOLERANT CONTROLLER DESIGN , AND APPLICATION OF THE SF/H  
APPROACH TO STABILIZATION AND PERFORMANCE ENHANCEMENT OF A FLEXIBLE  
ARM. THIS WILL LAY THE FOUNDATION FOR PHASE II DURING WHICH SF/H  
INFINITY -BASED CAD SOFTWARE PACKAGE FOR ROBOTIC APPLICATIONS WILL  
BE DEVELOPED.

SCIENTIFIC SYSTEMS INC

AF

\$ 59,825

ONE ALEWIFE PL - 35 CAMBRIDGE PARK DR  
CAMBRIDGE, MA 02140  
DR JAMES V CARROLL

TITLE:

TARGET ACCELERATION TERM IN HOMING MISSILE GUIDANCE

T 21 OFFICE: AFATL/FXG

THE LONG TERM OBJECTIVES (PHASE I, II AND III) OF THE PROPOSED  
EFFORT ARE TO DEVELOP AND MECHANIZED IMPROVED GUIDANCE LAWS AGAINST  
HIGHLY MANEUVERABILITY TARGETS; TO VERIFY THE PERFORMANCE OF SUCH  
GUIDANCE LAWS USING HARDWARE-IN-THE-LOOP SIMULATIONS AND FLIGHT  
TESTS. THE SPECIFIC PHASE I OBJECTIVES ARE: (i) TO SOLVE THE  
OPTIMAL GUIDANCE PROBLEM WITH CONSTRAINTS ON MISSILE ACCELERATIONS  
(ii) TO TEST THE NEW GUIDANCE LAW UNDER THE SAME CONDITIONS AS AGL  
TO DETERMINE ITS PERFORMANCE AND TO STUDY THE EFFECT OF THE TARGET  
ACCELERATION TERM, AND (iii) TO DETERMINE THE MECHANIZATION REQUIRE-  
MENTS OF THE NEW GUIDANCE LAW.

SCIENTIFIC SYSTEMS INC

AF

\$ 58,870

35 CAMBRIDGE PARK DR - ONE ALEWIFE PL  
CAMBRIDGE, MA 02140  
DONALD E GUSTAFSON

TITLE:

NONLINEAR CONTROL THEORY FOR MISSILE AUTOPILOT DESIGN

T 12 OFFICE: AFOSR/XOT

THE MISSILE AUTOPILOT DESIGN PROBLEM IS A NONLINEAR TIME VARYING  
STOCHASTIC CONTROL PROBLEM. PREVIOUS APPROACHES BASED ON EITHER  
CLASSICAL DESIGN OR LINEAR MULTIVARIABLE DESIGN HAVE PROVIDED IN-  
ADEQUATE FOR THE NEW GENERATION OF HIGHLY MANEUVERABLE AIR-TO-AIR  
MISSILES. THE PROPOSED RESEARCH WILL INVESTIGATE NONLINEAR DECOUPL-  
ING AND BIFURCATION ANALYSIS METHODOLOGIES FOR MISSILE AUTOPILOT  
DESIGN. THE PRIMARY EMPHASIS WILL BE ON BASIC RESEARCH SINCE THE

FISCAL YEAR 1986

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FIELD OF NONLINEAR CONTROL DESIGN IS STILL AT AN EMBRYONIC STAGE.

SCOPE INC 1860 MICHAEL FARADAY DR RESTON, VA 22090 DR JOHN F GREEN TITLE: A DIGITAL SYSTEM APPROACH FOR REALTIME HF EMITTER IDENTIFICATION T 56 OFFICE: CECOM/AMSEL	ARMY	\$ 84,310
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SCOPE PROPOSES TO DEVELOP A DIGITAL SIGNAL PROCESSING CONCEPT FOR THE REALTIME DETECTION AND IDENTIFICATION OF HF EMITTERS AND THEIR PLATFORMS. THIS INVESTIGATION WILL SPECIFICALLY EVALUATE HF EMITTER CHARACTERISTICS AND PHENOMENA OF POTENTIAL INTEREST FOR IDENTIFICATION. SIGNAL PROCESSING TECHNIQUES AND ALGORITHMS WILL BE DEFINED TO EXPLOIT EMITTER AND PLATFORM IDENTIFIABLE SIGNAL CHARACTERISTICS. ESTIMATES WILL BE DERIVED FOR ALGORITHM PERFORMANCE. AN IDENTIFICATION SYSTEM REQUIREMENTS ANALYSIS WILL BE PERFORMED TO SPECIFY SYSTEM CONFIGURATION AND COMPUTATIONAL GUIDELINES.

SCOPE INC 1860 MICHAEL FARADAY DR RESTON, VA 22090 DR JOHN F GREEN TITLE: A PASSIVE RF SEEKER AUTOMATIC SHIP TARGET IDENTIFIER AND CLASSIFIER FOR CRUISE MISSILES DEVELOPMENT T 173 OFFICE: JCM/NSWC-DL	NAVY	\$ 48,746
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AN RF SEEKER SIGNAL PROCESSING TECHNOLOGY IS PROPOSED TO BE DEVELOPED HERE TO PASSIVELY IDENTIFY AND CLASSIFY SHIP TARGETS FOR CRUISE MISSILES. THIS PROPOSED TECHNOLOGY IS AN ADAPTATION OF REAL TIME RF EMITTER IDENTIFICATION SYSTEMS PREVIOUSLY DEVELOPED AND IMPLEMENTED BY SCOPE, INC. THE FUNDAMENTAL CONCEPT RELIES ON THE PASSIVE EXPLOITATION OF UNINTENTIONAL CHARACTERISTIC MODULATIONS IMPOSED ON RF SIGNALS EMITTED FROM TARGET-MOUNTED TRANSMITTERS. THIS PROPOSED INVESTIGATION WILL RESULT IN A PRELIMINARY SYSTEM DESIGN WHICH INCLUDES DESCRIPTIONS OF CRITICAL SIGNAL PROCESSING ALGORITHMS. CRITICAL TECHNOLOGY AND DATA ISSUES WILL ALSO BE IDENTIFIED AND EVALUATED. A RECOMMENDATION WILL BE MADE FOR FURTHER SYSTEM RESEARCH



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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AND DEVELOPMENT, IF THE PHASE I STUDY INDICATES THAT THE PROPOSED CONCEPT IS FEASIBLE.

SEA TECH INC PO BOX 779 CORVALLIS, OR 97339 RICHARD W SPINRAD TITLE: AN OPTICAL FEEDBACK BASED HIGH ACCURACY BEAM TRANSMISSOMETER DEVELOPMENT T 11 OFFICE: ONR	NAVY	\$ 49,860
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A LIGHT SOURCE WILL BE DEVELOPED USING OPTICAL FEEDBACK, AND WILL BE INCORPORATED INTO A LIGHT BEAM TRANSMISSOMETER TO DEVELOP A PROTOTYPE FOR EVENTUAL PRODUCTION OF A HIGH ACCURACY, WAVELENGTH SELECTABLE BEAM TRANSMISSOMETER. THE ACCURACY IN MEASUREMENT OF PARTICLE VOLUME CONCENTRATION WITH THE EXISTING RED LIGHT (660 nm WAVELENGTH). 25 cm TRANSMISSOMETER IS APPROXIMATELY THIRTY PARTS PER BILLION. TRANS-MISSIOMETERS USING LOW POWER LIGHT EMITTING DIODES (LED'S), AT OTHER WAVELENGTHS ARE PRESENTLY INFEASIBLE DUE TO INSTABILITY AND LOW LIGHT OUTPUT. BY USING A SILICON DETECTOR WHICH HAS EXCELLENT STABILITY AND TEMPERATURE COEFFICIENT TO CONTROL THE LIGHT SOURCE (OPTICAL FEEDBACK), THE ACCURACY OF THE EXISTING RED LIGHT, 25 cm TRANSMISSOMETER. CONSEQUENTLY, THIS PROJECT WILL LAY THE GROUNDWORK FOR PRODUCTION OF WAVELENGTH SELECTABLE (I.E. USING GREEN, YELLOW, ORANGE, AND THE NEWLY DEVELOPED BLUE LED) TRANSMISSOMETERS. THIS WILL ALLOW DETERMINATION OF THE CONTRIBUTION OF DISSOLVED, AS WELL AS SUSPENDED MATERIAL TO THE ATTENUATION OF LIGHT IN NATURAL WATERS. THE PROJECT WILL BE PERFORMED PRIMARILY AS A LABORATORY BASED PROGRAM OF PROTOTYPE DEVELOPMENT, CALIBRATION, AND TESTING, FOLLOWED BY A BRIEF ASSESSMENT OF OPERATION IN THE FIELD.

SECURITY VENTURES CORP 25 BLACK LATCH LN CHERRY HILL, NJ 08003 DR DAVID SHEBY TITLE: NONLINEAR FREQUENCY ANALYSIS ALGORITHMS AND THEIR IMPLEMENTATIONS FOR NEW SURVEILLANCE SYSTEMS T 17 OFFICE: DARPA	DARPA	\$ 49,860
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ALGORITHMS BASED ON NONLINEAR FREQUENCY ANALYSIS OFFER THE POTENTIAL

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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FOR A NEW GENERATION OF MORE POWERFUL SURVEILLANCE ALGORITHMS. THE FUNDAMENTAL ARCHITECTURES FOR THEIR COMPUTER IMPLEMENTATION ARE THE SUBJECT OF THIS STUDY.

SEDIMENT DYNAMICS INTERNATIONAL LTD 1104 - 25TH AVE MOLINE, IL 61265 DR ANDREW P SALKIELD TITLE: FLUME INVESTIGATION OF A COMPOSITE EROSION-RESISTANT MATERIAL T 203 OFFICE: WES	ARMY	\$ 41,485
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FLUME TESTS OF THE SCOUR-RESISTANT PROPERTIES OF A COMPOSITE SCOUR-INHIBITING MATERIAL ARE PROPOSED. THE MATERIAL IS MADE FROM GRAVEL AND CLAY. BY FILLING THE PORE SPACES IN THE GRAVEL, THE CLAY PREVENTS TURBULENT FLUID BURSTS FROM PENETRATING THE GRAVEL AND "SUCKING OUT" UNDERLYING BED MATERIAL. THE SCOUR INHIBITOR REMAINS PLASTIC AND FORMS A GRADATIONAL MARGIN BETWEEN ANY RIGID STRUCTURE AND A MOBILE BED. THE PROGRAM OBJECTIVES ARE TO OBTAIN: 1. A COMPARISON OF STABILITY BETWEEN THREE GRADED GRAVELS AND A COMPOSITE INHIBITOR MATERIAL MADE FROM THE SAME GRAVEL AND PURE CLAY. 2. DATA ON THE EFFECT OF GRAVEL SIZE ON THE STABILITY OF THE SCOUR INHIBITOR.

SEITEC INC PO BOX 81264 CLEVELAND, OH 44181 GEORGE R SEIKEL TITLE: KW COMPLETELY MAGNETICALLY CONTAINED ELECTROTHERMAL THRUSTER T 77 OFFICE: AFRPL/TSTR	AF	\$ 49,991
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R&D ON A NVOEL ELECTRIC THRUSTER CONCEPT IS PROPOSED. THE BASIC CONCEPT OF THIS THRUSTER IS THAT THRUST IS PRODUCED BY THE EXPANSION OF HOT PLASMA IN A PAIR OF MAGNET NOZZLES. UPSTREAM CONTAINMENT OF THE PLASMA IS ACHIEVED BY A STABLE MAGNETIC CONTAINMENT SYSTEM. PLASMA HEATING IS ACCOMPLISHED BY A DC DISCHARGE BETWEEN THE TWO ANODES LOCATED INSIDE THE MAGNETIC NOZZLE COILS AND A DOWNSTREAM HOLLOW CATHODE WHICH IS LOCATED ON A MAGNETIC FIELD LINE THAT PASSES NEAR THE CENTER LINE OF THE ANODES. MOST OF THE PROPELLANT IS INJECTED INTO THE DISCHARGE THROUGH THE ANODES. THIS THRUSTER CONCEPT

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>BUILDS DIRECTLY ON BOTH THE BEST OF THE MAGNETOPLASMA DYNAMIC (MPD) THRUSTER AND EXISTING STELLARATOR TECHNOLOGY. PRIOR WORK HAS SHOWN THAT THIS TYPE THRUSTER HAS THE POTENTIAL OF ACHIEVING THRUST EFFICIENCIES APPROACHING 80% IN THE SPECIFIC IMPULSE RANGE OF 2000-3000 SECONDS, I.E. 50-100% HIGHER EFFICIENCY THAN ANY EXISTING PLASMA THRUSTERS. IN THE PROPOSED EFFORT AN OPTIMIZED ENGINEERING DESIGN OF A KW DC THRUSTER AND THE REQUIRED EQUIPMENT AND INSTRUMENTATION TO TEST AND UNDERSTAND IT'S PERFORMANCE WILL BE DEVELOPED. IN PHASE II, THE THRUSTER WOULD BE FABRICATED AND TESTED.</p>		

SEMCOR INC 309 FELLOWSHIP RD - EXECUTIVE PLAZA MOUNT LAUREL, NJ 08054 FRANCIS REINERT TITLE: SENSOR DATA ORGANIZATION STORAGE AND RECALL T 90 OFFICE: NAVAIR	NAVY	\$ 40,778
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SEMCOR, INC. PROPOSE TO PERFORM THE FOLLOWING TASKS: (a) COLLECT DATA PERTINENT TO THE RECORDING REQUIREMENTS OF P-3C UPDATE IV, (b) PERFORM A COMPARATIVE ANALYSIS OF THE SENSOR DATA, (c) EVALUATE THE OPERATIONAL ASPECTS, (d) ANALYZE INTERFACE AND INTEGRATION REQUIREMENTS, (e) INVESTIGATE LOGISTIC SUPPORT AND MULTIPLATFORM COMMONALITY, (f) SURVEY THE STATE-OF-THE-ART FOR LIKELY TECHNOLOGIES, (g) PERFORM A TRADE-OFF STUDY, AND (h) RECOMMEND AN APPROACH THAT SUPPORTS RAPID RECALL FOR VP OPERATIONS, AND SUPPORTS POST-MISSION ANALYSIS AND MISSION PLANNING AT GROUND FACILITIES. THE PHASE I RESULTS WILL PROVIDE THE BASIS FOR A FUNCTIONAL SPECIFICATION OF A RECORDER/REPRODUCER SUBSYSTEM.

SENSIS CORP THE MARKETPLACE - RTE 92 MANLIUS, NY 13104 ERNEST B ROCKWOOD TITLE: MULTI-STATIC RADAR (PASSIVE) APPLICABILITY FOR SMALL RADAR CROSS SECTION T 28 OFFICE: USMC/LBC	NAVY	\$ 49,860
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THE LOW RADAR CROSS-SECTION AIR TARGET IS A CREDIBLE, DIFFICULT

FISCAL YEAR 1986

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THREAT WHICH DEMANDS AN AIR DEFENSE CAPABILITY NOT NOW AVAILABLE. ONE PROMISING SOLUTION INVOLVES A MULTISTATIC RADAR. SUCH A RADAR HAS A NUMBER OF ATTRACTIVE FEATURES, BUT IT'S FUNDAMENTAL ADVANTAGE, VIS-A-VIS LOW RCS AIR TARGETS, IS THAT IT COUNTERS THE REDUCTION IN BACKSCATTERED ENERGY BY VIEWING TARGETS THROUGH BISTATIC ANGLES WHERE THE REFLECTED ENERGY MAY, IN FACT, BE ENHANCED. THIS PROPOSAL DESCRIBES A PARTICULAR MULTISTATIC RADAR SYSTEM WHICH APPEARS TO OFFER THE PRACTICAL, EFFECTIVE, AND ATTRACTIVE RESPONSE TO THE LOW RCS AIR TARGET THREAT. IT EXPLOITS THE FACT THAT, IN THE AN/TPS-59, THE USMC ALREADY DEPLOYS A RADAR WHICH COMES CLOSE TO ACHIEVING ADEQUATE COUNTER-STEALTH CAPABILITY. THE MARINE CORPS DOES NOT NEED A NEW RADAR TO BEAR THE TOTAL BURDEN OF DETECTING AND TRACKING LOW RCS AIR TARGETS. RATHER, IT NEEDS A RADAR TO COMPLEMENT THE AN/TPS-59, PROVIDING THE REQUIRED TOTAL SYSTEM CAPABILITY AT THE LOWEST ADDITIONAL COST AND COMPLEXITY. THIS IS PRECISELY WHAT THE PROPOSED MULTISTATIC RADAR DOES.

SHANNON & WILSON INC  
PO BOX C-30313 - 1105 N 38TH ST  
SEATTLE, WA 98103  
HARVEY W PARKER

AF

\$ 55,140

TITLE:  
ICBM DEEP BASING EGRESS MUCK FLOW TESTS  
T 241 OFFICE: BMO/MYSC

THIS PROJECT PROPOSES TO CONDUCT A LIMITED NUMBER OF MUCK FLOW EXPERIMENTS USING A CONTROLLED MUCK MATERIAL AND A SPECIALLY FABRICATED CHUTE SYSTEM. THE PROJECT WILL ATTEMPT TO DETERMINE HOW SOME OF THE FLOW FACTORS INTERACT WITH ONE ANOTHER TO INFLUENCE MUCK FLOW RATE. MEASUREMENTS OF MASS FLOW RATE IN TERMS OF THE RATE OF MUCK ACCUMULATION AT THE END OF THE CHUTE WILL BE MADE FOR 2 CHUTE ANGLES AND 3 CHUTE LENGTHS. RESULTS WILL BE COMPARED WITH INDEPENDENT COMPUTER SIMULATION OF MUCK CHUTE FLOW USING A DISCRETE ELEMENT COMPUTER PROGRAM. THE PROPOSED WORK IS PLANNED AND ORGANIZED AS A FIRST STEP IN THE CONTEXT OF A MAJOR EFFORT DIRECTED TOWARDS DEVELOPING AN OVER-ALL UNDERSTANDING OF MUCK AND DEVELOPMENT OF A CURRENT MANUAL OF PRACTICE SUITABLE FOR USE BY INDUSTRY AND GOVERNMENT AGENCIES INVOLVED IN UNDERGROUND AND EXCAVATION TECHNOLOGY.

SIGMA RESEARCH, INC.  
3200 GEORGE WASHINGTON WAY  
RICHLAND, WA 99352  
LARRY C. OLSEN

SDIO

\$ 49,898

TITLE:  
HIGH EFFICIENCY MULTIJUNCTION PHOTOVOLTAIC SYSTEM  
T 5 OFFICE:

THE PROPOSED PROGRAM WOULD DEVELOP A MULTIJUNCTION PHOTOVOLTAIC

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>SYSTEM BASED ON ACHIEVING SPECTRUM SPLITTING BY PASSING CONCENTRATED SUNLIGHT THOROUGH A PRISM. THE OVERALL OBJECTIVE OF THE PHASE I EFFORT IS TO DEMONSTATE THE FEASIBILITY OF A PRISM/SPECTRUM-SPLITTING MULTIJUNCTION CONCEPT FOR CONSTRUCTING A PHOTOVOLTAIC SYSTEM WITH AN AMO EFFICIENCY GREATER THAN 25% IN THE NEAR TERM AND ON THE ORDER OF 40% IN THE LONG TERM. THE PHASE I EFFORT WILL INVOLVE: DESIGN AND FABRICATION OF A PRISM TO SPLIT THE SOLAR SPECTRUM INTO TWO WAVELENGTH REGIONS APPROPRIATE FOR SI AND ALGAAS CELLS; FABRICATION AND CHARACTERIZATION OF A RED-ENHANCED SI CELL AND AN AL .27 GA .73AS CELL CAPABLE OF CONTRIBUTING TO THE SYSTEM EFFICIENCY 8.5% AND 16.5% RESPECTIVELY; DEMONSTRATION EXPERIMENTS TO SHOW THE FEASIBILITY OF ACHIEVING AN AMO EFFICIENCY OF 25% WITH SI AND ALGAAS CELLS USED WITH PRISM/SPECTRUM-SPLITTING; AND MODELING CALCULATIONS FOR A THREE-CELL SYSTEM. AT THE END OF PHASE I, IT IS EXPECTED THAT THE FEASIBILITY OF THE PRISM/SPECTRUM-SPLITTING APPROACH TO THE MANUFACTURE OF TWO OR THREE-CELL SYSTEMS, WITH SILICON AS THE LOW BANDGAP CELL, THAT EXHIBIT AN AMO EFFICIENCY GREATER THAN 25%. FINALLY, COMMERCIALIZATION OF THE TECHNOLOGY WOULD BE DONE IN PHASE III.</p>		

SIGPRO SYSTEMS INC PO BOX 4452 - 1121 BALDWIN ST - STE B SALINAS, CA 93912 DR LONNIE A WILSON TITLE: RF SEEKER AUTOMATIC SHIP TARGET CLASSIFICATION T 173 OFFICE: JCM/NSWC-DL	NAVY	\$ 68,559
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CRUISE MISSILE RF SEEKER SYSTEMS WILL BE REQUIRED TO PERFORM SHIP TARGET CLASSIFICATION FOR HIGH-VALUED TARGET SELECTION AND CONSERVATION OF MISSILE RESOURCES. THIS DEVELOPMENT PROPOSAL WILL INVESTIGATE THE TECHNICAL FEASIBILITY OF ADDING TARGET CLASSIFICATION TO CRUISE MISSILE RF SEEKERS. RF SEEKER IMPROVEMENTS WILL BE CONSIDERED AND NEW FEATURE EXTRACTION AND TARGET CLASSIFICATION PROCESSORS WILL BE CONSIDERED. ALSO FOURIER PHASE SPECTRUM CHARACTERISTICS WILL BE CONSIDERED FOR FEATURE INFORMATION CONTENT.

SILICON CONNECTION INC 493 E SIXTH ST - STE A TRACY, CA 95376 JON M SCHROEDER TITLE: BROAD INTEGRATION SYSTEM TO SUPPORT VHSIC(S) USING CONDUCTIVE POLYMERS T 13 OFFICE: DARPA	DARPA	\$ 47,959
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THIS PROPOSAL DESCRIBES THE EVOLUTION OF A NEW ARCHITECTURE FOR THE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT -----	AWARDED AMOUNT -----
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CREATION OF ADVANCED ELECTRONIC SYSTEMS. THE CONCEPT INVOLVES THE USE OF CONDUCTING AND SEMICONDUCTING ORGANIC POLYMERS, WHICH ARE TREATED BY PROCESS, JUST AS INTEGRATED SILICON, TO FORM A THREE DIMENSIONAL, FINE PITCHED, LIGHTWEIGHT CONDUCTIVE NETWORK TO INTERCONNECT VLSI/VHSIC CHIPS FOR MAXIMIZED PERFORMANCE. IT IS PROPOSED THAT BOTH OPTICAL AND ELECTRONIC SIGNAL PROCESSING CAN BE ACCOMPLISHED BY THIS TECHNIQUE. PROTOTYPES OF EACH OF THE CONCEPTS SUGGEST A SUCCESSFUL PHASE I DEVELOPMENT PROGRAM.

SILICON CONNECTION INC 493 E 6TH ST - STE A TRACY, CA 95376 JON M SCHROEDER TITLE: A NEW APPROACH TO ELECTRONIC PACKAGING FOR AIRBORNE SYSTEMS T 149 OFFICE: NWSC	NAVY	\$ 48,849
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THE SICON IS AN INNOVATIVE TECHNOLOGY THAT SOLVES A NUMBER OF PROBLEM AREAS IN MICROELECTRONIC INTERCONNECTION. VLSI CHIPS ARE ATTACHED TO THE SURFACE OF PRINTED WIRE BOARDS WITHOUT THE NEED FOR SOLDER. THIS FORMS A SELF HEALING, THERMAL EXPANSION ACCOMMODATING SYSTEM. THIS METHOD USES SHORT, FLAT, ETCHED INTERCONNECT PATTERNS WHICH ARE USEFUL WITH MICROWAVE CIRCUITS. THE ETCHED MICROINTERCONNECTION PATTERNS HAVE HIGH RESOLUTION AND ARE CAPABLE OF PRODUCING DUAL OR REDUNDANT I/O CONNECTIONS. A SELF HEALING METAL TO METAL SEAL IS PROPOSED THAT WILL FURTHER IMPROVE THE LEAK RATE OF THIS STRUCTURE ALLOWING IT TO QUALIFY AS A TRUE HERMETIC PACKAGE. THE PROPOSED SCOPE OF WORK CONSISTS OF (a) DEFINITION AND DESIGN OF A REPRESENTATIVE TEST SAMPLE TYPE, (b) TEST SAMPLE ASSEMBLY, (c) COST ANALYSIS OF SAMPLE PRODUCTION, (d) TEST EXECUTION, (e) TEST EVALUATION, (f) TECHNICAL AND COST TRADE-OFF ANALYSES, AND (g) PREPARATION AND SUBMITTAL OF A FINAL REPORT.

SILICON DESIGNS, INC. 13547 SE 27TH PLACE BELLEVUE, WA 98005 JOHN C. COLE TITLE: MINIATURE, RADIATION HARD ACCELEROMETER FOR KINETIC ENERGY VEHICLE T 7 OFFICE:	SDIO	\$ 93,675
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KINETIC-KILL VEHICLES WILL NEED GUIDANCE, NAVIGATION AND CONTROL

FISCAL YEAR 1986

SUBMITTED BY

DEPT

AWARDED  
AMOUNT

SYSTEMS CAPABLE OF OPERATING AFTER LONG PERIODS OF TIME IN A HOSTILE RADIATION ENVIRONMENT. COMPONENTS RESISTANT TO BURNOUT CAUSED BY EXPOSURE TO INTENSE LEVELS OF RADIATION MUST ALSO BE SMALL, LIGHT WEIGHT AND LOW-COST. SUITABLE LOW-COST INERTIAL SENSORS--ACCELEROMETERS AND GYROS--AND THE ELECTRONICS NEEDED TO INTERFACE THEM TO MICROPROCESSORS ARE NOT PRESENTLY AVAILABLE. SILICON DESIGNS IS CURRENTLY DEVELOPING A MINIATURE, LOW-COST, INTEGRATED CIRCUIT ACCELEROMETER COMPLETE WITH MICROPROCESSOR INTERFACING ELECTRONICS. WE BELIEVE THAT THE BASIC DESIGN OF THIS ACCELEROMETER CAN BE EXTENDED TO MEET THE RADIATION REQUIREMENTS FOR KINETIC-ENERGY VEHICLES, ACHIEVING A TOTAL DOSE HARDNESS OF  $10$  TO THE  $6$  POWER TO  $10$  TO THE  $7$  POWER RADS (SI). SOME PRELIMINARY WORK INDICATES THAT A GALLIUM ARSENIDE VERSION CAPABLE OF  $10$  TO THE  $8$ TH POWER RADS MAY ALSO BE POSSIBLE. IN PHASE II WE PROPOSE TO DEVELOP AND TEST A MINIATURE, RADIATION-HARD, LOW-COST ACCELEROMETER THAT MEETS THE REQUIREMENTS FOR KINETIC-ENERGY WEAPONS.

SIMULA INC  
10016 S 51ST STREET  
PHOENIX, AZ 85044  
R E ZIMMERMANN

AF

\$ 49,551

## TITLE:

DEVELOPMENT OF AN IMPROVED NECK FOR EJECTION SYSTEM TESTING  
MANIKINS

T 279

OFFICE: AMD/RDO

CURRENT TESTING MANIKINS HAVE BEEN DEVELOPED TO SIMULATE HUMAN RESPONSE TO IMPACT CONDITIONS PRIMARILY FOR APPLICATIONS IN THE AUTOMOTIVE INDUSTRY. OF MAIN CONCERN HAS BEEN THE RESPONSE OF THE NECK TO FORWARD AND LATERAL IMPACT DIRECTIONS. AS A RESULT, THE DEVELOPMENT AND IMPROVEMENT OF TEST MANIKINS HAVE FOCUSED ON SIMULATING THE HUMAN NECK IN THESE PRINCIPAL DIRECTIONS. CONSEQUENTLY, THERE HAS BEEN A COMPARATIVE SMALL AMOUNT OF DEVELOPMENT WORK TO IMPROVE THE BIOFIDELITY OF MANIKIN NECKS FOR APPLICATION IN EJECTION SEAT TESTING. A MORE COMPLEX NECK RESPONSE IS REQUIRED IN THIS APPLICATION, AND AUTOMOTIVE ANTHROPOMORPHIC DUMMIES CANNOT BE EXPECTED TO SIMULATE HUMAN-LIKE RESPONSE UNDER THESE CONDITIONS. IT IS PROPOSED THAT A THOROUGH INVESTIGATION BE MADE INTO THE ENGINEERING PROPERTIES OF THE HUMAN NECK AND THAT ITS REQUIRED RESPONSE IN ALL AXES AND DIRECTIONS BE DETERMINED. FROM THIS, THE DESIRED PROPERTIES AND FUNCTIONS

FISCAL YEAR 1986

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OF AN IMPROVED NECK WOULD BE DEFINED. CONCEPTS COULD THEN BE DEVELOPED FOR DESIGNING AND IMPROVED NECK WHICH WOULD PROVIDE THE DESIRED PROPERTIES AND FUNCTIONS AND BE ADAPTABLE TO EXISTING TEST MANIKINS. FINALLY, THE CONCEPTS WOULD BE EVALUATED TO IDENTIFY THE ONE MOST LIKELY TO RESULT IN A SUCCESSFUL DESIGN.

SIMULA INC 10016 S 51ST ST PHOENIX, AZ 85044 JOSEPH W COLTMAN TITLE: LIGHTWEIGHT SEALED PARACHUTE AND HARNESS ASSEMBLY T 86 OFFICE: NAVAIR	NAVY	\$ 50,000
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THE CURRENT NAVY INVENTORY OF PARACHUTES USED FOR NON-EJECTION EGRESS FROM AIRCRAFT IS PRIMARILY THE NB-8 CONFIGURATION. THIS PARACHUTE SYSTEM IS RELATIVELY HEAVY AND HAS A HIGH LIFE CYCLE COST RELATED TO THE FUEL CONSUMPTION, LOSS OF PAYLOAD CAPABILITY, AND REPACKING AT 210-DAY INTERVALS. THE PROGRAM DESCRIBED IN THIS PROPOSAL WILL EXPLORE POTENTIAL CONCEPTS FOR DEVELOPMENT OF A LIGHTWEIGHT ENVIRONMENTALLY SEALED PARACHUTE AND HARNESS ASSEMBLY THAT WOULD ELIMINATE THE DRAWBACKS OF THE CURRENT NB-8 SYSTEM. THE PROPOSED PHASE I EFFORT WILL IDENTIFY CONCEPTS CAPABLE OF MEETING THE FOLLOWING REQUIREMENTS: (1) MINIMUM REPACK CYCLE OF FIVE YEARS; (2) ENVIRONMENTALLY SEALED PARACHUTE; (3) QUICK-DONNING HARNESS; (4) TOTAL WEIGHT OF PARACHUTE AND HARNESS LESS THAN 17 LBS; (5) VERTICAL DESCENT RATE LESS THAN 24 FT/SEC WITH 265-LB SUSPENDED MASS; (6) ABILITY TO OPEN PARACHUTE UP TO 150 KNOTS AND (7) ABILITY FOR THE PARACHUTE TO GLIDE UPON COMMAND. THE PHASE I EFFORT WILL CULMINATE WITH THE SELECTION OF A CANDIDATE SYSTEM FOR FURTHER ENGINEERING DEVELOPMENT AND WILL ALSO DEFINE SPECIFIC REQUIREMENTS FOR THE PHASE II EFFORT.

SIMULA INC 10016 S 51ST ST PHOENIX, AZ 85044 JOSEPH W COLTMAN TITLE: ELASTOMERIC MATRIX MATERIALS FOR USE IN AIRCRAFT PRIMARY STRUCTURES EVALUATION T 46 OFFICE: AVSCOM AMSAV	ARMY	\$ 49,500
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THE TREND IN FUTURE U.S. ARMY AIRCRAFT IS TOWARD NON-EJECTION OF



FISCAL YEAR 1986

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<p>COMPOSITE MATERIALS IN PRIMARY STRUCTURES TO ACHIEVE WEIGHT REDUCTIONS AND LOWER PRODUCTION COSTS. THIS IS EVIDENCED BY THE ALL COMPOSITE AIRFRAME PROGRAM (ACAP) CURRENTLY BEING FUNDED BY THE ARMY. HOWEVER, THE POTENTIAL WEIGHT SAVINGS IS NOT BEING REALIZED DUE TO THE NEED TO OVERDESIGN TO ACCOUNT FOR THE INHERENTLY BRITTLE NATURE OF CURRENTLY-AVAILABLE MATRIX MATERIALS. THE RECENT DEVELOPMENT OF HIGH STRAIN ELASTOMERIC MATRIX MATERIALS OFFERS SIGNIFICANT POTENTIAL TO ACHIEVE HIGH IMPACT RESISTANCE WHILE MAINTAINING GOOD MECHANICAL PROPERTIES UNDER HOT/WET CONDITIONS. THE PROPOSED STUDY WILL IDENTIFY CANDIDATE ELASTOMERIC MATRIX SYSTEMS BASED ON PUBLISHED MECHANICAL PROPERTY DATA; ESTABLISH A STANDARD IMPACT TEST PROCEDURE; AND SELECT PROMISING MATRIX SYSTEMS BASED ON TOLERANCE TO IMPACT DAMAGE DERIVED FROM THE TEST RESULTS.</p>		

SKY COMPUTERS INC FOOT OF JOHN ST LOWELL, MA 01852 G N SHAPIRO TITLE: SUPERMICRO PROCESSOR FOR TABS-3 T 204 OFFICE: WES	ARMY	\$ 49,651
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A SUPER MICRO PROCESSOR BUILT AROUND OFF THE SHELF PC/AT COMPONENTS IS PROPOSED AS A PROCESSING NODE FOR TABS-3. THE SUPERMICRO IS CAPABLE OF PROCESSING POWER ONE ORDER OF MAGNITUDE LESS THAN A CRAY-1. THE ENGINE THAT GIVES THE PC/AT THE POWER IS A VECTOR SCALAR ENGINE CALLED THE VORTEX. THIS SUPERMICRO IS CAPABLE OF 20MFLOPS IN 32 BITS AND 13MFLOPS IN 64 BITS. APPLICATION SOFTWARE IS ACCOMMODATED BY A VECTORIZING PREPROCESSOR THAT PRODUCES VECTORIZED FORTRAN CODE FOR USE BY THE VORTEX.

SOFTWARE OPTIONS INC 22 HILLIARD ST CAMBRIDGE, MA 02138 DR MICHAEL KARR TITLE: SPECIFICATION OF SYSTEM DEVELOPMENT ACTIVITIES IN SOFTWARE ENGINEERING ENVIRONMENTS T 18 OFFICE: NAVSEA NOSC	NAVY	\$ 49,380
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SOFTWARE ENGINEERING ENVIRONMENTS ARE BEING DEVELOPED IN THE

FISCAL YEAR 1986

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OF PROGRAMMING, FROM THE EARLY PHASES OF RAPID PROTOTYPE GENERATION THROUGH THE MAINTENANCE OF RELEASED PRODUCTS. HOWEVER, MOST SOFTWARE ENGINEERING ENVIRONMENTS ARE CONCERNED PRIMARILY WITH THE ARTIFACTS OF PROGRAMMING, RATHER THAN WITH THE PROCESS OF SOFTWARE DEVELOPMENT. THEY PROVIDE TOOLS TO EDIT FILES AND TO RECORD THE MODULE STRUCTURE OF A PROGRAM; THEY DO NOT COORDINATE THE ACTIVITIES OF PROGRAMMERS WORKING TOGETHER ON A PROJECT NOR RECORD THE STRUCTURE OF THEIR RESPONSIBILITIES. SUPPORTING THE PROCESS OF SOFTWARE DEVELOPMENT REQUIRES THE ABILITY TO TRACK THE ACTIVITIES OF A PROJECT, TO AID OFFICIAL COMMUNICATION BETWEEN PROJECT MEMBERS, AND TO INTERPRET STATED RULES OF PROJECT ORGANIZATION. MOREOVER, BECAUSE SOFTWARE ENGINEERING ENVIRONMENTS ARE LARGE AND COMPLICATED PROGRAMS, THEY THEMSELVES ARE EXPENSIVE TO DEVELOP, MAINTAIN, AND MODIFY. THIS PROPOSAL SUGGEST THAT THERE IS A CONNECTION BETWEEN THE INFLEXIBILITY OF CURRENT SOFTWARE ENGINEERING ENVIRONMENTS AND THEIR NEGLECT OF COMMUNICATION AND COORDINATION, AND IT ADVOCATES INCORPORATING COMPUTATIONAL MODELS OF ACTIVITIES, MESSAGES, AND ORGANIZATIONAL RULES INTO FUTURE ENVIRONMENTS. THE FACILITIES THAT WE PROPOSE NOT ONLY SUPPORT THE PROCESS OF SOFTWARE DEVELOPMENT, BUT ALSO ARE A BASIS FOR DEFINING AND EVOLVING A FAMILY OF SOFTWARE ENGINEERING ENVIRONMENTS WITH REUSABLE COMPONENTS.

SOFTWARE TECHNOLOGIES INC  
30586 N GREENBRIAR  
FRANKLIN, MI 48025  
ROBERT J CARRICO  
TITLE:

ARMY

\$ 49,850

KNOWLEDGE REPRESENTATION USING TWO-PROCESS MENTAL MODELS FOR  
KNOWLEDGE-BASED SYSTEMS

T 153

OFFICE: LABCOM/BRL

USING A TWO-PROCESS KNOWLEDGE REPRESENTATION APPROACH, WE PROPOSE TO CONSTRUCT A DEFINITION OF MENTAL MODELS FOR KNOWLEDGE-BASED SYSTEMS. THIS EXPLOARTORY DEVELOPMENT PROJECT WILL ALSO DELINEATE THE SYSTEMS AND PROBLEM DOMAINS WHICH ARE BEST SUITED TO REPRESENTATION IN THIS WAY. THIS APPROACH WILL GIVE KNOWLEDGE REPRESENTATION IN EXPERT SYSTEMS A CLOSER RESEMBLANCE TO THE MENTAL MODELS THAT CHARACTERIZE HUMAN COGNITION, WHILE ALSO COMPENSATING FOR THE LIMITATIONS OF CERTAIN COGNITIVE FUNCTIONS. WE INTEND TO SHOW THAT SUCH A MODIFIED REPRESENTATION IMPROVES THE PERFORMANCE EFFICIENCY OF KNOWLEDGE-BASED SYSTEMS AND PERMITS THEM TO BE APPLIED TO LARGER AND MORE COMPLEX CON-

FISCAL YEAR 1986

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<p>TEXT-DEPENDENT PROBLEM DOMAINS. IN PHASE I, THE TWO-PROCESS KNOWLEDGE REPRESENTATION TECHNIQUE WILL BE DEVELOPED AND ITS FEASIBILITY WILL BE DEMONSTRATED. IMPROVEMENT OVER TRADITIONAL KNOWLEDGE REPRESENTATION SCHEMES WILL BE TESTED. IN PHASE II WE PROPOSE TO REFINED DEVELOPMENT METHODS AND TO DEVELOP A COMPLETE EXPERT SYSTEM PROTOTYPE USING THE NEW TECHNIQUE.</p>		

SOLTANOFF L & ASSOCS 127 FOUR BROOKS RD STAMFORD, CT 06903 LOUIS SOLTANOFF TITLE: LANDING GEAR PIN/BUSHING IMPROVEMENT T 146 OFFICE: AFWAL/FI	AF	\$ 50,000
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A SIGNIFICANT IMPROVEMENT TO THE LANDING GEAR PIN/BUSHING IS PROPOSED UTILIZING A "SOFT" PIN AND "HARD" BUSHING. IN ADDITION TO THE ADVANTAGES FORTHCOMING FROM THIS REVERSAL OF TRADITIONAL PRACTICE, THE NEW CONCEPT GREATLY EXTENDS THE LIFE OF THE WEARING ELEMENT, THE "SOFT" PIN, BY ACHIEVING UNIFORM WEAR OF THE SOFT ANTI-FRICTION SURFACE. THE EXTENSION OF LIFE LENGTHENS THE PERIOD BETWEEN REGULAR REPLACEMENT OF THE PIN, REDUCES SPARE PARTS COST AND IMPROVES OPERATIONAL READINESS. TOGETHER WITH THE ADVANTAGES OF THE "SOFT" PIN/"HARD" BUSHING OVER THE TRADITIONAL DESIGN, IMPRESSIVE SAVINGS IN TIME AND MONEY CAN BE REALIZED.

SONEX ENTERPRISES INC 1945 OLD GALLOWS RD - STE 610 VIENNA, VA 22180 LOUIS A STICKLES III TITLE: IMPROVED PROCEDURES/TOOLS FOR THE DEVELOPMENT OF HIGHLY RELIABLE SOFTWARE FOR COMPUTER WEAPONS SYSTEMS IDENTIFICATION AND APPLICATION T 76 OFFICE: CECOM/AMSEL	ARMY	\$ 47,231
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ARMY WEAPONS SYSTEMS ARE BECOMING INCREASINGLY DEPENDENT UPON THE SYSTEMS; THIS DEPENDENCY WILL INCREASE WITH THE GROWING USE OF ARTIFICIAL INTELLIGENCE ROBOTICS AND PARALLEL AND DISTRIBUTED PROCESSING. ATTENDANT TO THIS INCREASED USE IS INCREASED DEMANDS BETTER RELIABILITY PROCEDURES AND

FISCAL YEAR 1986

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TOOLS. THIS ANALYSIS EXAMINES THE ENVIRONMENT IN WHICH THE COMPUTER WEAPON SYSTEM OPERATES AND THE ASSOCIATED RELIABILITY PROBLEMS; IT IDENTIFIED EXISTING, APPLICABLE TOOLS AND PROCEDURES, ASSESSES THEIR EFFECTIVENESS, AND IDENTIFIES SHORTFALLS AND VOIDS. IT EXAMINES ALTERNATIVES IN THREE CATEGORIES: LOW COST, NEAR TERM, HIGH IMPACT MEASURES; MID-TO-LONG TERM MEASURES ESSENTIAL TO EMERGING SYSTEMS DEVELOPMENT; AND MEASURES WITH DEVELOPMENTAL APPLICATIONS (I.E., ADVANCEMENT OF SCIENCE). THE MAIN FOCUS ON THE ANALYSIS IS ON THE FIRST TWO AREAS AND WILL RESULT IN SPECIFIC AND EXECUTABLE RECOMMENDATIONS TO THE ARMY. THE NEAR-TERM MEASURES CAN BE DEVELOPED FOR IMPLEMENTATION IN PHASE II.

SOUTH COAST DATA INC 3136 PACIFIC COAST HWY TORRANCE, CA 90505 HOWARD R HILDRETH TITLE: DIRECT MUSCLE MULTIPLIER T 30 OFFICE: AD/YNS	AF	\$ 45,533
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THE U.S. AIR FORCE ROUTINELY LOADS VARIOUS TYPES OF INTERNAL AND EXTERNAL STORES ON AIRCRAFT, SUCH AS BOMBS, MISSILES, EQUIPMENT PODS, AND FUEL TANKS. THOSE ITEMS MAY WEIGH UP TO SEVERAL THOUSAND POUNDS. MANY OF THESE ITEMS EXCEED THE PHYSICAL CAPABILITY OF A HUMAN TO LIFT, TRANSPORT, AND POSITION. THIS THEN REQUIRES THE USE OF CUMBERSOME AND EXPENSIVE MACHINERY, SUCH AS SPECIALIZED FORKLIFT TYPES OF MACHINES, REQUIRING OPERATOR TRAINING AND LIMITING ACCESS TO SOME AREAS OF THE AIRCRAFT. THERE IS A NEED FOR A SIMPLE, INEXPENSIVE DEVICE THAT CAN MULTIPLY THE MUSCULAR STRENGTH OF A HUMAN OPERATOR SUCH THAT ITEMS UP TO FIVE HUNDRED POUNDS CAN BE HANDLED WITHOUT THE NECESSITY OF SUCH EQUIPMENT OR SPECIALIZED TRAINING. THIS PROPOSAL ADDRESSES THE DEVELOPMENT OF A NOVEL AND UNIQUE DIRECT MUSCLE MULTIPLIER WHICH WILL REMOVE REQUIREMENTS FOR GREAT INTRINSIC PHYSICAL STRENGTH ON THE PART OF THE OPERATOR TO HANDLE SUCH ITEMS, AND REQUIRES NO SPECILIZED TRAINING OR APTITUDE.

SPACE POWER INC 253 HUMBOLDT CT SUNNYVALE, CA 94089 WILLIAM D JACKSON TITLE: 50 kWe SPACE POWER CONDITIONER T 173 OFFICE: AFWAL/PO	AF	\$ 70,950
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SPACE POWER INC. HAS RECENTLY DEVELOPED A 10 -30 V INPUT DC/DC POWER

FISCAL YEAR 1986

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<p>CONDITIONER WITH A 10:1 VOLTAGE STEP-UP RATIO, WHICH HAS A POWER CAPACITY TO MASS RATIO (LOW SPECIFIC MASS) THAT IS A SUBSTANTIAL IMPROVEMENT OVER THE STATE-OF-THE-ART. ADDITIONAL OUTSTANDING FEATURES OF THIS DESIGN ARE ITS ABILITY TO OPERATE AT HIGH TEMPERATURES AND IN RADIATION FIELDS FOR USE WITH NUCLEAR POWERED SPACE CRAFT OR OPERATION IN VAN ALLEN BELTS. THIS SUCCESSFUL PROJECT WAS JUDGED AS A "BREAKTHROUGH" BY THE SP-100 ORGANIZATION, AND THE SECOND PHASE OF THIS WORK IS NOW STARTING WITH CONTINUED SPONSORSHIP BY USAF. IN MULTIMEGAWATT APPLICATIONS, THE POWER CONDITIONER INPUT VOLTAGE WILL BE IN THE RANGE OF 100 TO 200 Vdc FROM DIRECT CONVERSION THERMIONIC, FUEL CELL AND HIGH ENERGY BATTERY STEADY STATE AND "BURST" POWER SYSTEMS. HIGHER DC VOLTAGE ARE ALSO BEING ATTEMPTED IN LARGE SOLAR ARRAYS. THIS PROPOSAL PROVIDES A NEW MEANS OF APPLYING THE "BREAKTHROUGH" CURRENT SHARING PRINCIPLE TO A NEW CLASS OF SEMICONDUCTORS THAT ARE PARTICULARLY SUITED TO HIGHER OPERATING VOLTAGE, POWER AND TEMPERATURE. AS A RESULT, SPECIFIC MASS TO LESS THAN 0.1 kg/kWe WILL BE ACHIEVED.</p>		

SPACE SERVICES, INC.  
7015 GULF FREEWAY, SUITE 140  
HOUSTON, TX 77087  
WILLIAM H. GRISHAM

SDIO \$ 50,922

TITLE:  
SYNTHETIC APERTURE RADAR ADDITION HOLOGRAPHY  
T 3 OFFICE:

SARAH IS A BISTATIC (TWIN) SATELLITE SYNTHETIC APERTURE RADAR (SAR) CONCEPT. IT WILL PRODUCE GLOBAL HIGH RESOLUTION IMAGERY WITH IDEAL CHARACTERISTICS FOR THE SDI MISSION: ALL WEATHER, DAY OR NIGHT, GROUND PENETRATING, ACCURATELY REGISTERED, AND CONFORMAL (ADJACENT MAP PLATES FIT). IT WILL BE MORE COST EFFECTIVE SINCE IT IS THE ONLY KNOWN SAR WITH THE ATTRIBUTES NEEDED TO FULLY CAPITALIZE ON THE KNOWN ADVANTAGES OF COHERENT IMAGING AND DATA MANAGEMENT: ALL WEATHER, DAY OR NIGHT, GROUND PENETRATING, ACCURATELY REGISTERED, AND CONFORMAL (ADJACENT MAP PLATES FIT). IT WILL BE MORE COST EFFECTIVE SINCE IT IS THE ONLY KNOWN SAR WITH THE ATTRIBUTES NEEDED TO FULLY CAPITALIZE ON THE KNOWN ADVANTAGES OF COHERENT IMAGING AND DATA FORMAT. RESOLUTION WILL BE LESS THAN A WAVELENGTH, AND COULD BE AS SMALL AS 25 CENTIMETERS. THE IMAGERY CAN BE EITHER 2-D OR 3-D. BY USING A DOPPLER ENHANCED METHOD TO CREATE A ZONE PLATE OF A HUGH AREA AND DEGRADING THE RANGE RESOLUTION, LARGE POWER SAVINGS CAN BE

FISCAL YEAR 1986

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ACHIEVED. DEGRADING THE RANGE RESOLUTION PERMITS HUGE SYNTHETIC APERTURES FOCUSING THE VISIBLE EARTH'S CURVED SURFACE ALLOWING THE SECOND DIMENSION FROM THE ROTATION OF THE FIELD USING A METHOD SUCCESSFULLY DEVELOPED BY THE AIR FORCE. PATENT RIGHTS FOR SARAH ARE CLAIMED UNDER U.S. PATENT APPLICATION NO. 620,911.

SPACE TECH CORP.

SDIO

\$ 49,490

2324 MANCHESTER CT.

FT. COLLINS, CO 80526

MICHAEL ANDREWS

TITLE:

COMPUTER ARCHITECTURE/VERY HIGH LEVEL LANGUAGE DESIGN FOR BATTLE MANAGEMENT

T 9 OFFICE:

A STUDY OF THE EFFICIENCIES AND ENGINEERING TRADE-OFFS INTEGRATING REDUNDANT NUMBER SYSTEM WITH SYSTOLIC ARRAY PROCESSING ELEMENTS IN ORDER TO CAPTURE THE INHERENT FAULT TOLERANT PROPERTIES OF SIGNED DIGITS IS PROPOSED. USING SIGNED DIGITS REDUCES CARRY/BORROW DISTANCE TO A MINIMUM THUS REALIZING HIGHLY MODULARIZED AND COLUMNAR ARITHMETIC ENGINES. PROCESSING CELLS BECOME REGULAR WITH FEWER INTERCONNECTIONS BETWEEN CELLS, THUS REDUCING VLSI WIRE INTERCONNECT SPACE. YIELDS INCREASE AND LESS POWER IS NECESSARY. FAULT TOLERANT AND MORE RELIABLE CIRCUITS ALSO RESULT BECAUSE OF THE REGULAR YET SIMPLER PE'S. LESS INTERCONNECTS AND SIMPLER CIRCUITS MAY RESULT IN HIGHER RAD HARDENING YIELDS.

SPARTA INC

AF

\$ 48,702

23293 S POINTE DR (ORANGE COUNTY)

LAGUNA HILLS, CA 92658

DOUGLAS L HOGAN

TITLE:

TWO WAY TESTING OF VOICE COMMUNICATION SYSTEMS

T 41 OFFICE: ESD/XRCT

A COMMUNICATIONS SYSTEM THAT IS PROPOSED THAT ALLOWS AN OPERATIONAL USER TO DIRECTLY ASCERTAIN THE USEFULNESS OF THE SYSTEM, IN TERMS OF SPECIFIED REQUIREMENTS. THE METHOD HAS SEVERAL ADVANTAGES OVER PREVIOUS TEST METHODS, INCLUDING EASE AND COST OF ADMINISTRATION AND EASE OF RESULT ANALYSIS. IT ALSO RETAINS THE ADVANTAGES OF THE BEST

FISCAL YEAR 1986

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TWO-WAY COMMUNICATIONS TESTS WHILE ALLEVIATING THE PROBLEMS ASSOCIATED WITH THEM. FURTHERMORE, THE TEST METHOD IS READILY APPLIED TO VARIOUS KINDS OF SYSTEMS WITH VERY LITTLE EFFORT, HENCE THIS METHOD OR SIMILAR METHODS SHOULD IMPROVE STANDARDIZATION AMONG VOICE COMMUNICATION SYSTEMS USERS.

SPARTA INC  
23293 S POINTE DR  
LAGUNA HILLS, CA 92653  
YU-WEN CHANG

NAVY \$ 50,000

TITLE:

AIRCRAFT VELOCITY MEASUREMENT DURING CARRIER TAKEOFFS AND LANDING  
T 87 OFFICE: NAVAIR

A SIMPLE MILLIMETER WAVE SINGLE GUNN OSCILLATOR DOPPLER RADAR SENSOR IS PROPOSED TO ACCURATELY MEASURE THE AIRCRAFT TAKEOFF AND LANDING VELOCITY VECTOR. DOPPLER MEASUREMENT ACCURACY OF LESS THAN 100 Hz CAN EASILY BE ACHIEVED IN THE 60 GHz TO 94 GHz CARRIER FREQUENCY REGION.

SPARTA INC  
1055 WALL ST - STE 200  
LA JOLLA, CA 92038  
JOHN J GLATZ

AF \$ 53,229

TITLE:

STRUCTURAL JOINING METHODS FOR DISSIMILAR METAL AIR FRAMES  
T 128 OFFICE: AFWAL/FI

SPARTA, INC. PROPOSES A PROGRAM TO DEVELOP AN APPLICATION OF AN INNOVATIVE, LOW TEMPERATURE, SOLID-STATE BONDING TECHNIQUE TO PRODUCE DEFECT FREE JOINTS WITH A MINIMUM AMOUNT OF GROSS DEFORMATION, THERMAL DISTORTION, RESIDUAL STRESSES OR LOSS OF STRENGTH IN THE MATERIALS TO BE JOINED. THE OBJECTIVE OF THE PHASE I WORK IS TO APPLY THIS PROCESS TO THE FABRICATION OF JOINS BETWEEN DISSIMILAR METALS SUCH AS TITANIUM AND SUPERALLOY MATERIALS. THE RESULTS WILL BE COMPARED TO ALL BRAZING AND WELDING RESULTS BETWEEN THESE ADHERENDS THAT ARE AVAILABLE. THE STUDY APPROACH IS AS FOLLOWS: (1) IDENTIFICATION OF SPECIFIC JOINT CONFIGURATIONS AND MATERIALS, BASED ON DESIGN REQUIREMENTS; (2) SELECTION OF DIFFUSION BONDING AIDS BASED ON ADHEREND MATERIALS; (3) DEVELOPMENT OF THE DIFFUSION BONDING PRO-

FISCAL YEAR 1986

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CESS AND INITIAL JOINT DEFECT STUDIES; (4) TESTING AND EVALUATION OF JOINTS AND ASSESSMENT OF PROCESS SCALE-UP POTENTIAL AND; (5) DOCUMENTATION OF RESULTS.		

SPARTA INC 23293 S POINTE DR LAGUNE HILLS, CA 92653 HERMAN A REDISS TITLE: STABILITY AND CONTROL OF HYPERVELOCITY VEHICLES T 138 OFFICE: AFWAL/FI	AF	\$ 49,742
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IN THIS PROPOSAL, A GENERAL METHODOLOGY WILL BE DEVELOPED FOR THE ANALYSIS OF THE DYNAMICS AND STABILITY OF HYPERVELOCITY FLIGHT VEHICLES. A SYSTEMATIC APPROACH TO THE ANALYSIS AND DESIGN OF CONTROL SYSTEMS FOR THESE VEHICLES WILL BE DEVELOPED. THE APPROACH TO BE USED IS THE GENERALIZED MULTIPLE SCALES (GMS) METHOD ESTABLISHED BY THE PRINCIPAL INVESTIGATOR WHICH IS PARTICULARLY APPLICABLE WHEN THE DYNAMIC PHENOMENON EXHIBIT RAPID AND SLOW VARIATIONS AS IN THE CASE OF A HYPERVELOCITY VEHICLE. THE GMS APPROACH IS ALSO APPLICABLE TO THE DESIGN OF THE CONTROL SYSTEM. THE PHASE I EFFORT WILL DEVELOP THE METHODOLOGY AND VALIDATE IT TO A FIRST LEVEL USING AVAILABLE SPACE SHUTTLE DATA. THE PHASE II TASK WILL EXTEND THE TECHNIQUE TO TREAT MORE COMPLEX CHARACTERIZATIONS OF THE VEHICLE AND INCLUDE EXTENSIVE VALIDATION SIMULATIONS.

SPARTA INC 1055 WALL ST - STE 200 LA JOLLA, CA 92037 GARY WONACOTT TITLE: FASTENERS FOR ABOVE 500 DEG F ALUMINUM AIRFRAME STRUCTURES T 145 OFFICE: AFWAL/FI	AF	\$ 45,413
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SPARTA, INC. PROPOSES A PROGRAM TO ASSESS THE FEASIBILITY OF FABRICATING THERMALLY COMPATIBLE RIVET AND THREADED FASTENERS USING HIGH TEMPERATURE (HT) ALUMINUM ALLOYS (Al-Fe) FOR APPLICATION WITH 350 TO 650 DEG F AIRCRAFT STRUCTURAL COMPONENTS. THE OBJECTIVE OF PHASE I WILL BE TO PRODUCE FASTENERS WHICH ARE COMPATIBLE WITH HIGH TEMPERATURE ALUMINUM, CAN OPERATE IN AN ELEVATED TEMPERATURE ENVIRONMENT,



FISCAL YEAR 1986

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AND WILL SUSTAIN THE STRUCTURAL LOADS. THE PROGRAM WILL INVESTIGATE ALLOY AND PROCESSING VARIATIONS OF THE Al-Fe-X CLASS OF HIGH TEMPERATURE ALUMINUMS AND IDENTIFY THOSE PARAMETER VARIABLES WHICH WILL RESULT IN MATERIALS WITH THE FOLLOWING ATTRIBUTES: HIGH STRENGTH AT TEMPERATURE, MALLEABILITY (DUCTILITY), AND FRACTURE TOUGHNESS. THE PHASE I APPROACH WILL INCLUDE: 1) IDENTIFICATION OF TYPICAL AIRCRAFT COMPONENT APPLICATIONS AND ASSOCIATED DESIGN REQUIREMENTS, 2) IDENTIFICATION AND EVALUATION OF Al-Fe-X ALLOYS AND PROCESSING (E.G., HEAT TREAT) APPROACHES, 3) COMPONENT DESIGN STUDIES, 4) MEASUREMENT OF CRITICAL MECHANICAL PROPERTIES, 5) FABRICATION OF RIVETS AND TESTING IN ASTM JOINTS, 6) ANALYSIS OF "MOST PROMISING" FASTENER MATERIALS IN TYPICAL PARTS, AND 7) DOCUMENTATION OF RESULTS.

SPARTA INC  
1055 WALL ST - STE 200  
LA JOLLA, CA 92037  
GARY WONACOTT

NAVY

\$ 50,000

TITLE:

JOINING OF THERMALLY MIS-MATCHED COMPONENTS FOR HIGH VELOCITY  
MISSILES

T 56

OFFICE: NAVSEA

THERMAL MIS-MATCH BETWEEN CERAMIC COMPONENTS AND SUPERALLOYS PRIMARY STRUCTURE IN FLEET DEFENSE MACH 4 TO 8 TACTICAL MISSILES IS A CRITICAL DESIGN PROBLEM. TAILORING THE THERMAL EXPANSION OF A STRUCTURE INTERFACING BETWEEN THE CERAMIC AND SUPERALLOY IS THEORETICALLY POSSIBLE USING MMC. DURING THE LAST TWO YEARS TECHNOLOGY DEVELOPED BY THE NAVY HAS PRESENTED A UNIQUE OPPORTUNITY TO SIGNIFICANTLY IMPACT THE THERMAL MIS-MATCH PROBLEM USING AN INTERFACE MMC STRUCTURE WITH A GRADED C.T.E. HOWEVER, THE MMC INTERFACE STRUCTURE MUST ALSO HAVE SUFFICIENT STRUCTURAL INTEGRITY AND STIFFNESS TO SUSTAIN THE STRUCTURAL DESIGN REQUIREMENTS AND MAINTAIN THE MISSILE PERFORMANCE. THIS SEVEN TASK PROGRAM WILL TEST THE FEASIBILITY OF USING GRAPHITE/COPPER AND OR GRAPHITE/ALUMINUM FOR THE INTERFACE MATERIAL. THE SEVEN TASKS INCLUDE 1) SELECTION OF CANDIDATE MISSILE COMPONENTS AND DETERMINATION OF STRUCTURAL DESIGN REQUIREMENTS, 2) ESTABLISHMENT OF MATERIAL DESIGN GOALS AND ASSEMBLY OF A MATERIAL DATA BASE, 3) MATERIAL DESIGN STUDIES AND INTERFACE CONCEPTS DEVELOPMENT, 4) INTERFACE CONCEPTS STRUCTURAL INTEGRITY EVALUATION, 5) DEVELOPMENT OF A CRITERIA AND SELECTION OF "MOST PROMISING" CONCEPTS, 6) TEST ARTICLE FABRICATION AND C.T.E. TESTING, AND 7) IDENTIFICATION OF CRITICAL DESIGN ISSUES

FISCAL YEAR 1986

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AND TECHNOLOGY DEVELOPMENT PLAN PREPARATION.

SPARTA INC 23293 S POINTE DR LAGUNA HILLS, CA 92653 DAN O TURNER TITLE: DEPRESSED TRAJECTORY EFFECTS ON BMD SYSTEMS T 249 OFFICE: BMO/MYSC	AF	\$ 50,000
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DEPRESSED TRAJECTORY ICBMS HAVE SUBSTANTIALLY DIFFERENT TIMELINES AND CHARACTERISTICS THAN MINIMUM ENERGY TRAJECTORIES. WHILE IT IS TRUE THAT HARD TARGETS ARE NOT EASILY ATTACKED WITH DEPRESSED TRAJECTORIES DUE TO CEP DEGRADATION, AN INCREASING AWARENESS IN THE STRATEGIC COMMUNITY OF THE INCREASED PENETRATIVITY AND DAMAGE POTENTIAL OF DEPRESSED TRAJECTORIES AGAINST RELATIVELY SOFT BUT DEFENDED TARGETS (AIRFIELD, INDUSTRY, LOGISTICS CENTERS, ETC.) HAS MOTIVATED AN ASSESSMENT OF THEIR UTILITY. THIS EFFORT WILL EVALUATE THE POTENTIAL VALUE OF COMBINING THE RESPONSIVENESS/TIMELINES OF ICBMS WITH DEPRESSED TRAJECTORIES AGAINST CRITICAL MILITARY TARGETS. IN PARTICULAR, WE WILL EXAMINE THEIR POTENTIAL FOR INCREASING DETERRENCE BY SUPPRESSING BMD SYSTEMS THAT ARE EFFECTIVE AGAINST U.S. SLBMS AND AIR DEFENSE SYSTEMS, THAT ARE EFFECTIVE AGAINST U.S. BOMBERS AND CRUISE MISSILE.

SPARTA INC 1055 WALL ST - STE 200 LA JOLLA, CA 92037 DR LOWELL D MCMILLEN TITLE: DUAL BETA JAMMERS T 265 OFFICE: BMO/MYSC	AF	\$ 72,793
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A STUDY IS PROPOSED TO DEVELOP CONCEPTUAL DESIGNS OF SMALL JAMMER CONFIGURATIONS WHICH PROVIDE DUAL BETA CHARACTERISTICS BASED ON AERODYNAMICS. THESE DUAL BETA JAMMERS ARE DESIGNED TO BE DEPLOYED OVER RADAR SITES AT A MEDIUM TO HIGH BETA AND THEN ACHIEVE A LOW BETA TO ENHANCE RESIDENCE TIME WITHIN THE RADAR SEARCH LINE OF SITE. A FOLLOW-ON PROGRAM WILL BE FORMULATED TO PROVIDE A DEVELOPMENT OF A PROTOTYPE VEHICLE SUITABLE FOR TESTING OF THE DUAL BETA CONCEPT.

FISCAL YEAR 1986

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SPARTA INC 5401 E LA PALMA AVE ANAHEIM, CA 92807 REED D COPSEY TITLE: COMPUTER AIDED ENGINEERING OF WARHEADS T 145 OFFICE: LABCOM/BRL	ARMY	\$ 59,494
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THE RESEARCH EFFORT FOR THIS PROJECT IS DIVIDED INTO TWO PHASES. THE FIRST PHASE INVOLVES THE STUDY OF EXISTING HARDWARE AND SOFTWARE, IN WHICH SPARTA'S EXTENSIVE EXPERIENCE IN WARHEAD DESIGN, CONTINUUM MECHANICS PROGRAMS, AND CAD-CAM WILL BE USED TO DETERMINE SUITABLE FEATURES FOR INCORPORATION INTO THE DESIRED SYSTEM. THIS STUDY WILL ALSO PINPOINT ANY AREAS WHERE EXISTING TECHNOLOGY IS INADEQUATE TO MEET THE OBJECTIVE. PHASE TWO IS THE ACTUAL DEVELOPMENT OF THE INTEGRATED SYSTEM, INCLUDING ANY TECHNOLOGICAL ADVANCES NECESSARY TO OVERCOME CURRENT SHORTCOMINGS. PHASE TWO WILL CONCLUDE WITH THE DEMONSTRATION OF THE CAPABILITIES OF THE SYSTEM IN THE SOLUTION OF REAL-WORLD WARHEAD DESIGN PROBLEMS.

SPARTA INC 7926 JONES BRANCH DR - STE 1070 MCLEAN, VA 22102 ROBERT H STINE TITLE: DISTRIBUTED DATABASE MANAGEMENT SYSTEM T 149 OFFICE: LABCOM/BRL	ARMY	\$ 49,999
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A PRIMARY PURPOSE OF DATA COMMUNICATION NETWORKS IS TO ALLOW FOR COMPUTER RESOURCE SHARING. DATA BASE MANAGEMENT SYSTEMS (DBMSS) ARE VALUABLE COMPUTER RESOURCES, YET EVEN AMONG NETWORKED HOSTS, IT IS CURRENTLY APPLICATIONS SOLVE THIS PROBLEM ON AN AD HOC BASIS. IDBAS, AN INTERNET DATA BASE ACCESS SYSTEM, WILL SIMPLIFY ACCESS TO DISPARATE DBMSS BY PROVIDING A COHERENT GLOBAL SCHEMA AND A SINGLE, USER FRIENDLY INTERFACE FOR ACCESSING AN INTERNET'S DATA BASES.

SPARTA INC 1104 CAMINO DEL MAR DEL MAR, CA 92014 STUART N ROSENWASSER TITLE: A LABORATORY RAILGUN FOR ARC ARMATURE RESEARCH STUDIES T 152 OFFICE: LABCOM/BRL	ARMY	\$ 49,348
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RAILGUNS ARE OF CONSIDERABLE INTEREST FOR ARTILLERY, ANTI-ARMOR AND

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AMOUNT

AIR DEFENSE APPLICATIONS. THE SUCCESSFUL DEVELOPMENT OF RAILGUNS WILL DEPEND, IN PART, ON UNDERSTANDING THE BEHAVIOR OF THE PLASMA ARMATURE THAT PROPELS THE PROJECTILE, AND THE INTERACTION OF THE ARMATURE WITH THE BORE MATERIALS. MOST EXISTING EXPERIMENTAL RAILGUNS ARE NOT WELL SUITED FOR THIS RESEARCH. THEY HAVE LOW AVAILABILITY BECAUSE OF BORE SURFACE DAMAGE AND THE TIME/LABOR REQUIRED TO REPLACE BORE COMPONENTS. THE PROPOSED PHASE 1 PROGRAM ADDRESSES THE ANALYSIS AND DESIGN OF A LABORATORY RAILGUN SPECIFICALLY FOR THE STUDY OF ARC ARMATURES. IT WILL FEATURE HIGH STRUCTURAL INTEGRITY, MINIMUM MAINTENANCE, ADVANCED MATERIALS TO REDUCE BORE DAMAGE, SIMPLIFIED ASSEMBLY/DISASSEMBLY, PROVISION FOR SIMULTANEOUSLY INJECTING BOTH PLASMA AND PROJECTILE AND EASY ACCESS FOR DIAGNOSTIC PROBES. SPARTA, IN CONJUNCTION WITH MAXWELL LABORATORIES, INC., WILL CALCULATE DESIGN PARAMETERS BASED ON THE BRL PERFORMANCE REQUIREMENTS AND WILL UTILIZE BOTH UNIQUE DESIGN CONCEPTS AND ADVANCED MATERIALS TO DEVELOP A CONCEPTUAL DESIGN FOR A RAILGUN MEETING THESE REQUIREMENTS. IT IS PLANNED THAT THE DEVICE WILL UNDERGO FINAL DESIGN AND CONSTRUCTION IN PHASE 2.

SPARTA INC  
23293 S POINTE DR  
LAGUNA HILLS, CA 92653  
B K BHAGAVAN

ARMY

\$ 50,000

## TITLE:

ADAPTIVE RADOME BORESIGHT ERROR COMPENSATION  
T 111 OFFICE: MICOM

SEEKER BORESIGHT ERRORS CAUSED BY RADOME REFRACTION ARE OF CONCERN IN RADAR GUIDED MISSILES BECAUSE THEY PRODUCE UNWANTED FEEDBACKS IN THE HOMING SYSTEM AND COULD LEAD TO PERFORMANCE DEGRADATION OR EVEN INSTABILITY. CURRENTLY USED COMPENSATION TECHNIQUES - RADOME TAILORING AND ERROR MAPPING - ARE EXPENSIVE, TIME CONSUMING, LIMITED IN APPLICATION TO NARROWBAND SYSTEMS, AND CANNOT ACCOUNT FOR IN-FLIGHT VARIATIONS DUE TO HEATING, ABLATION, ETC. SPARTA PROPOSES TO DEVELOP A TECHNIQUE FOR REAL-TIME ESTIMATION AND COMPENSATION OF RADOME ERRORS. A CAREFULLY DESIGNED SINUSOIDAL STIMULUS IS INJECTED INTO THE HOMING LOOP AND RADOME ERROR SLOPES ARE ESTIMATED FROM THE RESULTING OSCILLATIONS IN THE MEASURED BORESIGHT ERRORS. THE COMPENSATION SIGNAL IS GENERATED FROM THIS ESTIMATE AND APPLIED TO THE SEEKER TRACK LOOP. SINCE THE PROPOSED TECHNIQUE ESTIMATES RADOME ERRORS IN REAL-TIME, THE COMPENSATION SCHEME IS ADAPTIVE TO VARIA-

FISCAL YEAR 1986

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TIONS IN RADOME ERRORS. COMPUTER SIMULATION OF A HOMING SYSTEM WILL BE UTILIZED TO EVALUATE THE PERFORMANCE OF THE PROPOSED ESTIMATION AND COMPENSATION SCHEMES, AND TO STUDY THE SENSITIVITY OF THE PERFORMANCE TO VARIOUS PARAMETERS.		

SPARTA INC 23293 S POINTE DR LAGUNA HILLS, CA 92653 DR GUIDO HASSIN TITLE: SURVIVING THE ENEMY'S USE OF DIRECTED ENERGY WEAPONS (1995 - 2015) T 21 OFFICE: USMC/LBC	NAVY	\$ 49,669
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THE ANTICIPATED INTRODUCTION OF DIRECTED ENERGY (DE) WEAPONS INTO SOVIET TACTICAL COMBAT FORCES POSES A SERIOUS THREAT TO THE ABILITY OF THE MARINE CORPS TO PERFORM ITS MISSION. APPROPRIATE COUNTER-MEASURES (CMs) MUST BE IDENTIFIED, DEVELOPED, AND DEPLOYED IN ORDER TO COUNTERACT THIS THREAT. THIS PHASE I STUDY WILL IDENTIFY POSSIBLE THREAT DE WEAPONS AND ANALYZE THEM TO DETERMINE EFFECTIVENESS VERSUS MARINE CORPS WEAPON SYSTEMS. POTENTIAL CMs WILL THEN BE IDENTIFIED, AND ENGAGEMENT ANALYSES WILL BE PERFORMED TO ASSESS CM EFFECTIVENESS. LIFE CYCLE COST ANALYSIS METHODOLOGY WILL BE DEVELOPED AND APPLIED TO ONE CM. RESULTS AND RECOMMENDATIONS WILL BE PROVIDED FOR DETAILED MISSION EFFECTIVENESS ANALYSIS AND LIFE CYCLE COST ANALYSIS IN A PHASE II EFFORT (NOT INCLUDED IN THIS PROPOSAL).

SPARTA INC 23293 S POINTE DR - STE 250 LAGUNA HILLS, CA 92653 W A GRENARD TITLE: A METHOD FOR RAPID ASSESSMENT OF DAMAGE OF EXPEDITIONARY AIRFIELDS DEVELOPMENT T 23 OFFICE: USMC/LBC	NAVY	\$ 49,332
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A STUDY IS PROPOSED TO SELECT A WORKABLE METHOD FOR QUICKLY ASSESSING DAMAGE TO EXPEDITIONARY AIRFIELDS, SO THAT THEY CAN BE REPAIRED WITH THE MINIMUM AMOUNT OF RESOURCES IN AS SHORT A TIME AS POSSIBLE. RUNWAYS CAN BE EITHER PAVED OR MADE OF ALUMINUM MATTING. SINCE ENEMY TROOPS, OR TOXIC AGENTS CAN BE PRESENT, SAFETY AND SUR-

FISCAL YEAR 1986

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AMOUNT

VIVABILITY ARE CONSIDERATIONS. BECAUSE THE MISSION CAN BE AT NIGHT, THE USE OF INFRARED OR RADAR SENSORS IS EMPHASIZED, ALONG WITH CONCEPTS THAT UTILIZE ARTIFICIAL LIGHTING. THE STUDY PROPOSES TO: 1. LOCATE THE ASSUMED REQUIREMENTS TO SENSORS, VEHICLES, DATA RETURN DEVICES, AND ASSESSMENT EQUIPMENT, AND TO EVALUATE A NUMBER OF OVERALL SYSTEM CONCEPTS. THE EVALUATION WILL CONSIDER ASSESSMENT PERFORMANCE IN TERMS OF RESOLUTION AND TIMELINESS; PRACTICALITY; ABILITY TO USE EXISTING HARDWARE; ABILITY TO ACHIEVE INITIAL OPERATIONAL CAPABILITY IN A SHORT TIME; AND LIFE CYCLE COST. COLLECTION SYSTEMS WILL INCLUDE MANNED AND UNMANNED SYSTEMS, AND WILL CONSIDER SYSTEMS THAT OVERFLY THE AIRFIELDS, SYSTEMS THAT EMBLACE SENSORS AT THE AIRFIELD, AND EXPENDABLE SYSTEMS. THE EVALUATION WILL RESULT IN THE SELECTION OF THE BEST OVERALL SYSTEM CONCEPT(S), AND THE DEVELOPMENT OF A PLAN TO DEMONSTRATE MEASUREMENT CAPABILITY, PROVIDE AN INTERIM OPERATIONAL CAPABILITY, AND DEVELOP AN OPERATIONAL SYSTEM.

SPARTA INC

DNA

\$ 74,995

PO BOX 1354 - 1055 WALL STREET 200

LA JOLLA, CA 92038

DR HARVEY M BERKOWITZ

TITLE:

STRUCTURAL DESIGN FOR ELECTRONICS HARDENING AGAINST RADIATION-INDUCED THERMOMECHANICAL RESPONSE DAMAGE

T 5 OFFICE: AM/SBIR

THIS PHASE I SBIR EFFORT WILL ESTABLISH THE FEASIBILITY OF USING STRUCTURAL ANALYSES AND GOOD STRUCTURAL DESIGN PRINCIPLES TO HARDEN ELECTRONICS COMPONENTS (e.g., CHIPS OR CHIP PACKAGES) AGAINST THERMOMECHANICAL RESPONSE DAMAGE INDUCED BY ENERGY DEPOSITIONS FROM NEUTRAL PARTICLE BEAM (NPB) DIRECTED ENERGY WEAPONS (DEWs), OR NUCLEAR WEAPONS EFFECTS (NWE; i.e., X-RAYS, GAMMA RAYS, AND NEUTRONS), AND THEREBY IMPROVE U.S. SYSTEMS SURVIVABILITY AGAINST USSR DEW NPB AND NUCLEAR THREATS. THE MAIN QUESTIONS TO BE ANSWERED THROUGH THIS PHASE I EFFORT ARE (1) "WHAT CAN BE DONE THROUGH STRUCTURAL DESIGN/ANALYSIS TO HARDEN ELECTRONICS COMPONENTS (e.g., CHIP OR CHIP PACKAGE) MANUFACTURERS INCORPORATE INTO THEIR PRODUCTS SUCH STRUCTURAL DESIGN PRINCIPLES FOR HARDENING?" THE PROGRAM APPROACH WILL BE TO SURVEY CURRENT PRACTICES, DESIGN HARDEN REPRESENTATIVE FABRICABLE COMPONENTS, DEVELOP STRUCTURAL DESIGN HARDENING GUIDELINES/PRINCIPLES, IDENTIFY POTENTIAL MANUFACTURERS OF HARDENED COMPONENTS, AND PREPARE THE SBIR PHASE II DESIGN, ANALYSIS, FABRICATION AND TEST PLANS.

FISCAL YEAR 1986

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AMOUNT

SPARTA, INC.  
23293 S POINTE DR - STE 25  
LAGUNA HILLS, CA 92653  
WILLIAM A GRENARD

NAVY

\$ 49,111

TITLE:

EXPERT PROCESS PLANNING SYSTEM (EPPS)

T 150

OFFICE: NWSO

SPARTA, INC. PROPOSES TO STUDY OUTSTANDING ISSUES REQUIRING RESOLUTION BEFORE AN EXPERT SYSTEM CAN BE DESIGNED FOR STRUCTURAL MECHANICAL MANUFACTURING PLANNING. THE KEY ELEMENTS OF SUCH AN EXPERT SYSTEM WOULD BE: (1) A GEOMETRIC MODELER CAPABLE OF DESCRIBING GEOMETRY IN TERMS OF PART FEATURES, AS WELL AS NON-GEOMETRIC INFORMATION; (2) AN ARTIFICIAL INTELLIGENCE PROCESSOR; (3) A MANUFACTURING PLANNING KNOWLEDGE BASE; AND (4) A USER INTERFACE ENVIRONMENT SUPPORTING THREE CATEGORIES OF USERS, NAMELY, DESIGNERS, PLANNERS, AND KNOWLEDGE BASE ANALYSTS. THE APPLICATION FOR THE SUBJECT MANUFACTURING PLANNING EXPERT SYSTEM WOULD BE THE CREATION OF PROCESS PLANS FOR MACHINED PARTS.

SPARTA, INC.  
11048 CAMINO DEL MAR  
DEL MAR, CA 92014  
STUART N. ROSENWASSER

SDIO

\$ 84,818

TITLE:

HIGH PERFORMANCE ACTIVELY COOLED RAILS DEVELOPMENT FOR RAPID FIRE ELECTROMAGNETIC LAUNCHERS

T

2

OFFICE:

THE EFFICIENT INTERSHOT COOLING OF THE CONDUCTIVE RAILS IN RAPID-FIRE RAILGUNS IS ESSENTIAL TO THEIR PERFORMANCE AND SURVIVABILITY AS ELEMENTS IN A BALLISTIC MISSILE DEFENSE SYSTEM. PRELIMINARY ANALYSIS INDICATES THAT A COMBINATION OF ADVANCED ACTIVE COOLING AND UNIQUE MATERIALS TECHNOLOGY WILL BE REQUIRED TO PROVIDE THE EXTREMELY HIGH HEAT REMOVAL RATES FOR SEVERAL RAILGUNS CURRENTLY BEING DEVELOPED FOR SDI. SPARTA, INC. PROPOSES TO UTILIZE ITS SPECIAL LOW-TEMPERATURE SOLID-STATE BONDING METHOD AND ADVANCED MATERIALS TO DEVELOP HIGH-STRENGTH, MONOLITHIC COOLED-RAIL STRUCTURES WITH MULTIPLE SMALL COOLANT CHANNELS. THE RAIL COOLING CONFIGURATIONS WILL BE DESIGNED FOR

FISCAL YEAR 1986

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<p>OPERATION IN THE HIGHLY TURBULENT TO SUBCOOLED NUCLEATE BOILING REGIME IN ORDER TO ACHIEVE THE REQUIRED HEAT REMOVAL RATES. THE OBJECTIVES OF PHASE 1 INCLUDE DEFINING COOLING REQUIREMENTS FOR A SPECIFIC SMALL CALIBER SYSTEM, EVALUATING AND SELECTING A COOLING CONCEPT, DESIGNING THE THERMAL-HYDRAULIC CONFIGURATION TO MEET THE REQUIREMENTS; DEVELOPING THE PROCEDURES AND PARAMETERS AND ESTABLISHING THE FEASIBILITY OF FABRICATING THE SELECTED CONFIGURATIONS; PRODUCING COOLED-RAIL SEGMENTS AND DEFINING A SUBSCALE, ELECTRICALLY PULSED, COOLING TEST PROGRAM FOR PHASE 2.</p>		

SPARTA, INC. 23293 SO. POINTE DR. LAGUNA HILLS, CA 92653 YU-WEN CHANG, PHD TITLE: MILLIMETER WAVE SEMIACTIVE TERMINAL HOMING	SDIO	\$ 50,000
T 2 OFFICE:		

A MILLIMETER WAVE SEMIACTIVE HOMING TECHNOLOGY DEVELOPMENT IS PROPOSED FOR KEW. ELECTRONIC BEAM STEERING PHASE ARRAY AND TINY MONOLITHIC INTEGRATED KEW RECEIVER ARE PROPOSED BASED ON GaAs TECHNOLOGY.

SPARTA, INC. 1055 WALL ST., SUITE 200 LA JOLLA, CA 92038 JOEL M. ZUIEBACK TITLE: INCORPORATING KINETIC ENERGY IMPACT HARDNESS IN METALLATED CARBON LASER SHIELD MATERIALS	SDIO	\$ 99,563
T 8 OFFICE:		

METALLATED CARBON COMPOSITES (MCC) ARE CARBON OR GRAPHITE MATERIALS LOADED WITH REFRACTORY METALS. THIS CLASS OF MATERIALS IS BEING CONSIDERED AS HIGH INTENSITY LASER IRRADIATION RESISTANT DUE TO THEIR LOW ABSORPTIVITY, HIGH HEAT OF ABLATION, AND RESISTIVE BURN THROUGH TIME. AS SHIELD MATERIALS FOR KINETIC ENERGY IMPACTS. THE SPARTA SHIELD MATERIALS ARE BOTH PRIMARY (OUTER) AND SECONDARY (INNER) SHIELD MATERIALS. WORK HAS BEEN DONE ON KINETIC ENERGY IMPACTS AT HYPERVERLOCITY SPEEDS. DATA HAS BEEN OBTAINED



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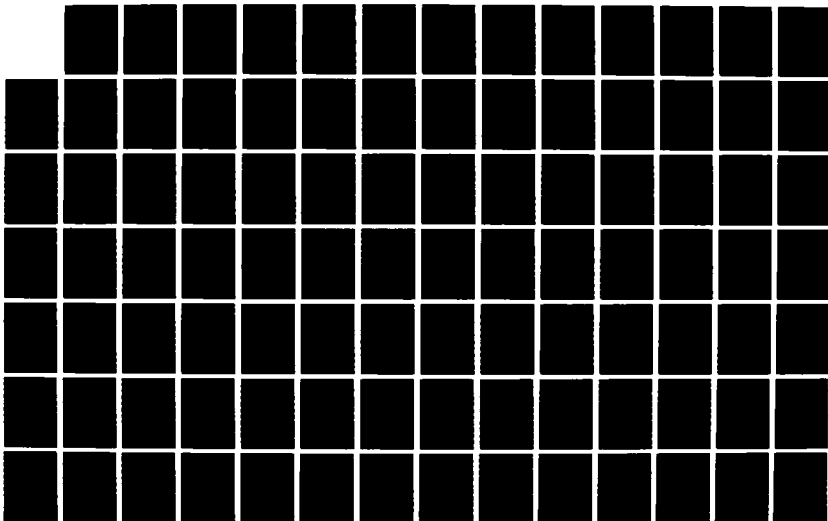
DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
(SBIR) ABSTRACTS OF PHASE I AWARDS (1986)(U) DEPARTMENT  
OF DEFENSE WASHINGTON DC 1986

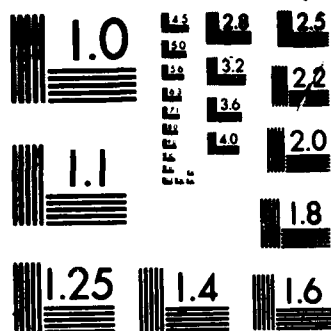
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MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

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CARBON MATERIALS FOR REENTRY VEHICLE NOSETIP AND HEATSHIELD RESPONSE UP TO ABOUT 6 KM/SEC. THUS, IT IS NOT CLEAR HOW THE MCC CLASS OF MATERIALS WILL PERFORM WHEN DIRECTLY EXPOSED TO KINETIC ENERGY IMPACTS. THIS PROJECT IS DESIGNED TO OBTAIN LIMITED DATA TO ASSESS THE KINETIC ENERGY IMPACT HARDNESS OF CANDIDATE MCC LASER SHIELD MATERIALS AND IDENTIFY APPROACHES TO INCORPORATING IMPROVED KINETIC ENERGY IMPACT HARDNESS OF THIS CLASS OF MATERIALS.

SPECIAL ILLUMINATION SYSTEMS INC

AF

\$ 66,576

444 VOLUSIA AVE

DAYTON, OH 45409

LEE A CROSS

TITLE:

AN ADVANCED VIDEO SYSTEM FOR BEHIND-PANEL FRAGMENTATION STUDIES

T 26

OFFICE: AFATL/SAV

A NOVEL OPTICAL DIAGNOSTIC APPARATUS FOR BEHIND-PANEL FRAGMENTATION STUDIES IS PROPOSED. THE GOAL OF THE WORK WILL BE TO DEMONSTRATE THAT MEASUREMENTS OF THE FRAGMENT MASS, VELOCITY, TRAJECTORY CAN BE MADE WITH A SYSTEM WHICH REQUIRES AN ABSOLUTE MINIMUM OF OPERATOR INTERVENTION. THE INITIAL DATA-GATHERING WILL UTILIZE THE CAPABILITIES OF AN ORTHOGONAL, BACK-LIT, MULTI-FRAME RECORDING CAMERA. HIGH POWER, NARROW LINEWIDTH LASER ILLUMINATORS WILL BE EMPLOYED TO DISCRIMINATE AGAINST IMPACT FLASH. VIDEO CAMERAS WILL PRODUCE DATA IN A FORM WHICH IS AMENABLE TO COMPUTER-ASSISTED ANALYSIS IN A NEARLY COMPLETELY AUTOMATIC MODE. NEAR INFRARED IMAGING SYSTEMS WILL PROVIDE MUCH HIGHER SENSITIVITY TO SMALL PARTICLES THAN CAN X-RAY SYSTEMS.

SPECTRAL SCIENCES INC

AF

\$ 69,273

111 S BEDFORD ST

BURLINGTON, MA 01803

MICHAEL E GERSH

TITLE:

A FIBER OPTIC FLUORESCENT PROBE FOR AIRCRAFT FUEL LEAK  
IDENTIFICATION AND CHARACTERIZATION

T 184

OFFICE: AFWAL/PO

AIRCRAFT FUEL LEAKS REPRESENT A SIGNIFICANT FIRE AND EXPLOSION HAZARD. AT PRESENT, IF A LEAK IS SUSPECTED IN AN EQUIPMENT-FILLED AIR-

FISCAL YEAR 1986

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DEPT

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AMOUNT

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CRAFT BAY, IT IS NECESSARY TO REMOVE THE EQUIPMENT BEFORE BEING ABLE TO CHARACTERIZE WHAT MAY BE A LEAK THAT IS SMALL ENOUGH NOT TO BE OF CONCERN. THIS COULD RESULT IN WASTED MANPOWER AND EXCESSIVE AIRCRAFT DOWN TIME. THE PROPOSED INSTRUMENT IS DESIGNED TO FULFILL THE REQUIREMENT FOR A FUEL LEAK CHARACTERIZATION DEVICE THAT CAN DETERMINE THE LOCATION AND SIZE OF A LEAK WITHOUT HAVING TO REMOVE EQUIPMENT FROM A BAY. THIS DEVICE WORKS ON THE PRINCIPLE OF MEASURING THE VISIBLE FLUORESCENT EMISSION INTENSITY FROM A FUEL LEAK SPOT WHICH HAS BEEN ILLUMINATED BY ULTRAVIOLET LIGHT. THE UV LIGHT IS CARRIED INTO, AND THE FLUORESCENCE CARRIED OUT OF, THE BAY BY A FIBER OPTIC PROBE, WHICH ALSO INCLUDES A FIBERSCOPE FOR VISUALLY LOCATING THE LEAK. THE PHASE I OBJECTIVE IS TO DEMONSTRATE THE DEVICE CONCEPT USING A LABORATORY BREADBOARD. A PROTOTYPE INSTRUMENT WOULD BE DESIGNED, CONSTRUCTED, AND TESTED IN PHASE II.

SPECTRAL SCIENCES INC

ARMY

\$ 62,174

111 S BEDFORD ST

BURLINGTON, MA 01803

STEVEN C RICHTSMEIER

TITLE:

PAVEMENT ICE DETECTOR SYSTEM

T 201

OFFICE: CRREL/COE

ICE FORMATION ON ROADWAYS AND RUNWAYS IS A PARTICULARLY INSIDIOUS PROBLEM BECAUSE ITS PRESENCE IS OFTEN UNKNOWN TO A VEHICLE OPERATOR. QUICK DETECTION OF ICE OR CONDITIONS FAVORING ITS FORMATION WILL ALLOW FOR TIMELY APPLICATION OF DEICING COMPOUNDS. THIS NOT ONLY IMPROVES SAFETY, BUT IT ALSO REDUCES MANPOWER, EQUIPMENT, AND CHEMICAL COSTS BY OPTIMIZING THE TIMING AND METHOD OF TREATMENT. WE PROPOSE A NOVEL SCHEME FOR MEASURING ROADWAY SURFACE CONDITIONS USING A COMPACT, PORTABLE SYSTEM WHICH COULD BE MOUNTED ON A CAR OR TRUCK. IT WOULD PROVIDE A CONTINUOUS READOUT OF PAVEMENT CONDITIONS AS THE VEHICLE DRIVES ALONG A ROADWAY OR RUNWAY. THE SYSTEM USES RAMAN SCATTERING OF LIGHT BY THE SURFACE CONSTITUENTS TO DETERMINE THE PRESENCE OF WATER, ICE, AND CHEMICALS ON THE PAVEMENT. IT HAS ALREADY BEEN DEMONSTRATED THAT RAMA SCATTERING CAN BE USED TO DETECT AND DISTINGUISH WATER AND ICE. OUR PHASE I OBJECTIVE IS TO DEMONSTRATE FEASIBILITY UNDER REALISTIC CONDITIONS. THE RAMA SCATTERING SPECTRUM OF WATER AND ICE IN THE PRESENCE OF PAVEMENT AND DEICING CHEMICALS WILL BE MEASURED. THIS WILL ALLOW FOR THE CHOICE OF OPTIMAL SPECTRAL BANDS FOR A DEMONSTRATION ICING MONITORING TO BE BUILT

FISCAL YEAR 1986

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AND FIELD ("ROAD") TESTED UNDER ICING CONDITIONS IN PHASE II.

SPECTRAL SCIENCES, INC. 111 SOUTH BEDFORD ST. BURLINGTON, MA 01803 LAWRENCE BERNSTEIN, PHD TITLE: PRECISE MISSILE BODY LOCATION USING VACUUM CORE EMISSION T 3 OFFICE:	SDIO	\$ 74,845
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IN ORDER FOR ANY DIRECTED ENERGY WEAPON SYSTEM TO BE EFFECTIVE, IT MUST BE CAPABLE OF LOCATING THE TARGET AND DISCRIMINATING AGAINST CLUTTER AND COUNTERMEASURES. THIS PROPOSAL CONSIDERS THE PROBLEM OF ACCURATE ROCKET BODY LOCATING USING PLUME INFRARED EMISSION. INFRARED (IR) VACUUM CORE RADIATION NEAR THE ROCKET MOTOR NOZZLE IS A PROMISING SIGNATURE COMPONENT FOR THIS APPLICATION. A NOVEL SENSOR CONCEPT FOR PRECISE BOOSTER LOCATION IS PROPOSED, WHICH PERMITS ONE TO OBSERVE THE VACUUM CORE RADIATION, WHILE DISCRIMINATING AGAINST INTERFERING COMPONENTS OF THE PLUME SIGNATURE AS WELL AS POTENTIAL IR COUNTERMEASURES. THIS DISCRIMINATION IS PERFORMED BY USING A SPECTRAL FILTERING TECHNIQUE WHICH SELECTIVELY ABSORBS THE INTERFERING RADIATION WHILE TRANSMITTING MOST OF THE VACUUM CORE EMISSION. LOCATION OF THE ROCKET ENGINE EXIT PLANE TO APPROXIMATELY ONE METER MAY BE POSSIBLE WITH THIS TECHNIQUE. A FEASIBILITY ANALYSIS OF THIS SENSOR CONCEPT IS PROPOSED FOR PHASE I. DESIGN, CONSTRUCTION, AND LABORATORY DEMONSTRATION OF A PROTOTYPE SENSOR WOULD BE PERFORMED IN PHASE II.

SPECTRAL SCIENCES, INC. 111 S. BEDFORD ST. BURLINGTON, MA 01803 JAMES W. DUFF, PHD TITLE: FUEL LEAK AND ATMOSPHERIC REACTION EMISSION SIMULATION T 3 OFFICE:	SDIO	\$ 74,907
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CATASTROPHIC DESTRUCTION OF BOOST PHASE MISSILES BY, FOR EXAMPLE, PARTICLE BEAM OR KINETIC ENERGY WEAPONS COULD RESULT IN THE RELEASE OF MASSIVE QUANTITIES OF PROPELLANT. THE RESULTING FIREBALL, WHICH IS DUE TO CHEMICAL REACTIONS OF THE PROPELLANT COMPONENTS WITH EACH OTHER AND WITH THE ATMOSPHERE, PRODUCES SPATIALLY EXTENSIVE, IN-

FISCAL YEAR 1986

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<p>TENSELY BRIGHT, AND TEMPORALLY PERSISTENT EMISSION FROM THE ULTRAVIO- LET THROUGH THE LONG WAVE INFRARED WAVELENGTH REGION. IT IS CRUCIAL TO CHARACTERIZE SUCH PROPELLANT DUMP SIGNATURES BOTH FOR ACCURATE ASSESSMENT OF TARGET DESTRUCTION AND ALSO AS AN IMPORTANT CONSIDERA- TION IN SENSOR DESIGN AND SIGNAL PROCESSING ALGORITHM DEVELOPMENT. IN PHASE I A SOFTWARE SIMULATION MODEL, FLARES (FULE LEAK AND ATMOS- PHERIC REACTION AND EMISSION SIMULATION), WOULD BE DEVELOPED FOR LIQUID PROPELLANT MISSILES. REPRESENTATIVE CALCULATIONS FOR SELECTED SCENARIOS OF INTEREST WOULD BE PERFORMED. IN PHASE II THE MODEL WOULD BE APPLIED TO ANALYSIS OF EXISTING AND PLANNED PROPELLANT RE- LEASE EXPERIMENTS. PHASE II WOULD ALSO INCLUDE PLANNING FOR A PHASE III FIELD MEASUREMENT PROGRAM INVOLVING PROPELLANT RELEASE APPROPRI- ATE TO DESTRUCTION OF LARGE MISSILES.</p>		

SPECTRAN CORP 50 HALL RD STURBRIDGE, MA 01566 PETER C SCHULTZ TITLE: LONG LENGTH FLUORIDE OPTICAL FIBER T 52 OFFICE: RADC/DOR	AF	\$ 45,000
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THIS PROPOSAL IS ADDRESSING THE PROBLEMS OF DRAWING DEFECT-FREE  
LENGTHS OF FLUORIDE FIBER (> 500 m) WITH GOOD STRENGTH AND MECHANICAL  
PROPERTIES. SPECTRAN HAS EXTENSIVE EXPERIENCE IN BULK HMFG AND HAS  
RECENTLY ESTABLISHED A FIBER DRAW FACILITY FOR FLOURIDE FIBER. WE  
PROPOSE TO USE THE PREFORM TECHNIQUE APPROACH WITH INCREASED PREFORM  
AND INCREASED PREFORM LENGTH IN ORDER TO DRAW DECREASED FIBER  
LENGTHS. BY CAREFULLY CONTROLLING THE PREFORM CASTING TECHNIQUE,  
RAW MATERIALS, MOLD MATERIALS AND FIBER DRAW PARAMETERS, WE BELIEVE  
WE CAN ACHIEVE THE FIBER LENGTHS IN EXCESS OF 1 km AND MORE.

SPECTRAN CORP 50 HALL RD STURBRIDGE, MA 01566 RICHARD DRIVER TITLE: OPTICAL FIBER SENSOR FOR CHEMICAL AGENT DETECTION AND IDENTIFICATION T 22 OFFICE: USMC/LBC	NAVY	\$ 42,684
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A SIMPLE TWO WAVELENGTH REMOTE FIBER OPTIC SPECTROMETER WILL BE

FISCAL YEAR 1986

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DEVELOPED FOR THE MID INFRARED DETECTION OF ORGANOPHOSPHATE CHEMICAL AGENTS. OPTICAL FIBER WILL BE FABRICATED FROM FLUORIDE GLASSES WHICH ARE BEING DEVELOPED FOR LONG RANGE COMMUNICATION. THE SUBJECT OF SUITABLE LIGHT SOURCES AND DETECTORS FOR MID INFRARED SENSOR OPERATION WILL BE INVESTIGATED. DIFFERENT GEOMETRIES OF REMOTE GAS PROBE WILL BE TRIED INCLUDING AN EVANESCENTLY COUPLED GAS PROBE. FOR SPECIES IDENTIFICATION A MULTI WAVELENGTH FTIR FIBER SPECTROMETER WILL BE INVESTIGATED. PROJECTED LIMITS FOR DIRECT ABSORPTION AND PHOTOACOUSTIC SENSING ARE GIVEN AS A FUNCTION OF BANDSTRENGTH.

SPINFORM INDUSTRIES INC  
20735 BELSHAW AVE  
CARSON, CA 90746  
W G GATES

NAVY

\$ 66,790

## TITLE:

NET SHAPE SPINFORMING OF TITANIUM  
T 148 OFFICE: NWSC

A COMPUTER NUMERICAL CONTROLLED PROCESS FOR SPINFORMING NET SHAPE HEMISPHERES AND HEMISPHERICAL-ENDED CYLINDERS WILL BE DEVELOPED. FORTY PARTS WILL BE SPINFORMED ON EXISTING CNC CONTROLLED EQUIPMENT. IMPROVEMENT OF MECHANICAL PROPERTIES BY COLD WORK AND THERMAL MECHANICAL TREATMENT WILL BE INVESTIGATED. DIMENSIONAL TOLERANCES, METALLURGICAL STRUCTURES AND MECHANICAL PROPERTIES PRODUCED BY EACH PROCESS AND SHAPE WILL BE EXAMINED, CHARACTERIZED AND REPORTED.

SPIRE CORP  
PATRIOTS PARK  
BEDFORD, MA 01730  
JAMES K HIRVONEN

DARPA

\$ 74,840

## TITLE:

EROSION-RESISTANT EM LAUNCHER RAIL MATERIALS  
T 6 OFFICE: DARPA

EROSION ON RAILS AND SLIDING ELECTRICAL CONTACTS WILL LIMIT THE LIFETIME, ACCURACY, AND RELIABILITY OF ELECTROMAGNETIC LAUNCHERS AND GUNS. WE PROPOSE TO INVESTIGATE ION IMPLANTATION AND ION BEAM ENHANCED DEPOSITION (IBED) TO INCREASE THE EROSION LIFETIME OF COPPER ALLOYS AND REFRACTORY SINTERED MATERIALS PRESENTLY CONSIDERED FOR RAILGUN ELECTRODES. IONS WILL BE IMPLANTED INTO THE ELECTRODE

FISCAL YEAR 1986

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MATERIALS TO FORM A THIN LAYER OF REFRACTORY MATERIAL WHICH SHOULD BE VERY RESISTANT TO EROSION. THE IBED PROCESS WILL CREATE HIGHLY ADHESIVE FILMS OF NITRIDES OR CARBIDES WITH SUPERIOR MECHANICAL AND CHEMICAL PROPERTIES, WITHOUT CHANGING THE ELECTRICAL OR THERMAL PROPERTIES OF THE SUBSTRATE. THE PHASE I PROGRAM WILL TEST THESE SURFACE MODIFIED MATERIALS IN A SLIDING-CONTACT ENVIRONMENT SIMULATING THE BREECH REGION OF A RAIL ACCELERATOR, AND THEORETICAL STUDIES WILL COMPLEMENT THE EXPERIMENTAL WORK. ENCOURAGING RESULTS WILL LEAD TO A PHASE II STUDY IN WHICH SURFACE-MODIFIED RAIL MATERIALS ARE EVALUATED IN OPERATING RAILGUN SYSTEMS.

SPIRE CORP  
PATRIOTS PK  
BEDFORD, MA 01730  
STANLEY W VERNON

DARPA \$ 63,678

TITLE:  
DOPING MOCVD GROWN  $ZnS_xSe_{1-x}$  p-TYPE BY ION IMPLANTATION/EXCIMER  
LASER ANNEALING FEASIBILITY STUDY

T 11 OFFICE: DARPA

THE LACK OF A PROCESS TO DOPE  $ZnS(x)Se(1-x)$  FOR p-TYPE CONDUCTIVITY IS THE MAJOR OBSTACLE TO THE ADVANCEMENT OF DEVICE TECHNOLOGY BASED ON WIDE BANDGAP p/n HOMOJUNCTIONS. OF PARTICULAR IMPORTANCE ARE LIGHT-EMITTING DIODES AND INJECTION LASERS FABRICATED FROM  $ZnS_xSe(1-x)$  WHICH OPERATE IN THE BLUE OR ULTRAVIOLET REGIONS OF THE SPECTRUM, ESSENTIAL FOR SOME TYPES OF SOPHISTICATED COMMUNICATION. SPIRE PROPOSES TO DOPE  $ZnS_xSe(1-x)$  GROWN BY METALORGANIC CHEMICAL VAPOR DEPOSITION p-TYPE BY ION IMPLANTATION, FOLLOWED BY EXCIMER-LASER ANNEALING, WHICH WILL "QUENCH IN" DESIRABLE ACCEPTOR LEVELS AT CONCENTRATIONS PREVIOUSLY UNOBTAINABLE BY MORE CONVENTIONAL METHODS. THE PHASE I RESEARCH IS A FEASIBILITY STUDY OF THIS METHOD IN WHICH THE IONS (NITROGEN, VANADIUM, AND PHOSPHORUS) AND IMPLANTATION PARAMETERS WILL BE VARIED AFTER THE LASER PARAMETERS ARE OPTIMIZED. ELECTRICAL MEASUREMENTS WILL BE MADE TO DETERMINE CARRIER TYPE, CONCENTRATION, AND MOBILITY FROM ONE SET OF STRUCTURES, AND JUNCTION CHARACTERISTICS WILL BE MEASURED ON THE SECOND SET. FINALLY, THE EMPIRICAL RESULTS WILL BE COMPARED AND ASSESSED SO THAT THE SUPERIOR ROUTE(S) MAY BE PURSUED IN PHASE II RESEARCH.

SPIRE CORP  
PATRIOTS PK  
BEDFORD, MA 01730  
LEO GEOFFROY

NAVY \$ 69,322

TITLE:  
FABRICATION OF SUPERIOR ION BEAM LITHOGRAPHY MASKS

T 181 OFFICE: NAVAIR/NOSC

THE PROPOSED PROJECT ADDRESSES IMPROVED MASK TECHNOLOGY FOR ION BEAM



FISCAL YEAR 1986

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LITHOGRAPHY. SPECIFICALLY, TECHNIQUES FOR PERFECTING THE SILICON MEMBRANE USED IN SUCH MASKS ARE PRESENTED, AND RESEARCH INTENDED TO INCORPORATE SUCH TECHNIQUES IN MEMBRANE FABRICATION IS PROPOSED. IN PHASE I, THE FEASIBILITY OF BOTH IMPROVING THE CRYSTALLINE PERFECTION AND OF ALTERING THE STRESS IN THE MEMBRANES WILL BE EVALUATED. TECHNIQUES INVOLVING BOTH EPITAXY AND ION IMPLANTATION WILL BE INVESTIGATED. IN PHASE II RESEARCH ON IMPROVED MEMBRANES WILL BE CARRIED OUT. THIS RESEARCH WILL BE BASED UPON THE APPROACHES DETERMINED TO BE FEASIBLE IN PHASE I. THE MEMBRANES THUS DEVELOPED WILL BE MADE AVAILABLE TO THE INDUSTRY AS PART OF THE COMMERCIALIZATION IN PHASE III.

SPIRE CORP	AF	\$ 64,627
PATRIOTS PK		
BEDFORD, MA 01730		
STANLEY M VERNON		
TITLE:		
HIGH QUALITY GaAs LAYERS FOR MICROWAVE APPLICATIONS BY ISOELECTRONIC DOPING TECHNIQUES		
T 152	OFFICE: AFWAL/ML	

MONOLITHIC MICROWAVE INTEGRATED CIRCUITS (MMIC'S) MADE OF GaAs ARE BECOMING INCREASINGLY IMPORTANT FOR USE IN MILITARY SYSTEMS. A MAJOR LIMITATION TO ADVANCEMENT IN THIS FIELD IS THE QUALITY OF THE SEMI-INSULATING GaAs SUBSTRATES AVAILABLE. SPIRE PROPOSES TO DEVELOP A TECHNIQUE FOR PRODUCING HIGH-QUALITY, LOW-DISLOCATION-DENSITY WAFERS BY THE USE OF AN ISOELECTRONICALLY DOPED GaAs BUFFER LAYER WHICH IS KNOWN TO REDUCE DEFECT PROPAGATION. THE ISOELECTRONIC DOPING OF THIS THIN LAYER IS EXPECTED TO AVOID THE PROBLEMS ENCOUNTERED WITH ISOELECTRONICALLY DOPED BULK SUBSTRATE MATERIALS AND SHOULD PERMIT THE DEPOSITION OF ADDITIONAL EPITAXIAL LAYERS OF DEVICE QUALITY. THE PHASE I EFFORT WILL SEEK TO DEMONSTRATE THE FEASIBILITY OF GROWING IN-DOPED GaAs BUFFER LAYERS IN A PRODUCTION-SIZE METALORGANIC CHEMICAL VAPOR DEPOSITION (MO-CVD) REACTOR AND TO ASSESS THEIR EFFECTIVENESS FOR DISLOCATION REDUCTION.

SPIRE CORP	AF	\$ 64,231
PATRIOTS PK		
BEDFORD, MA 01730		
STANLEY M VERNON		
TITLE:		
HIGH QUANTUM EFFICIENCY PHOTOCATHODES FOR DETECTION OF 1.06 MICROMETER RADIATION		
T 62	OFFICE: AFSTC/OLAB	

LOW-NOISE PHOTOCATHODES ABLE TO DETECT 1.06 MICROMETER - WAVELENGTH

FISCAL YEAR 1986

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AMOUNT

RADIATION WITH REASONABLE EFFICIENCY ARE NEEDED FOR SPACEBORN LIDAR SENSOR SYSTEMS UTILIZING ND:YAG LASERS. PHOTOCATHODES WITH 1.06 MICROMETER QUANTUM EFFICIENCIES EXCEEDING 1% HAVE BEEN FABRICATED IN THE PAST BUT ARE NOT COMMERCIALY AVAILABLE AT PRESENT. SPIRE PROPOSES TO DEVELOP NEGATIVE-ELECTRON-AFFINITY PHOTOCATHODES BASED ON THE USE OF GaInAs ACTIVE LAYERS. WHILE MANY III-V MATERIALS HAVE THE PROPER BANDGAP TO DETECT 1.06 MICROMETER RADIATION, GaInAs HAS ADVANTAGES SUCH AS A PROVEN ABILITY TO DEMONSTRATE HIGH QUANTUM EFFICIENCY AND LONG DIFFUSION LENGTHS IN OTHER APPLICATIONS AND A SIMPLICITY OF DEPOSITION CONTROL NOT FOUND IN THE QUATERNARY COMPOUNDS. THE EPITAXIAL STRUCTURE WILL BE GROWN BY METALORGANIC CHEMICAL VAPOR DEPOSITION ON A GaAs SUBSTRATE. PHASE I RESEARCH WILL SEEK TO DEMONSTRATE THE FEASIBILITY OF GROWING GaInAs LAYERS WHICH POSSESS OPTOELECTRONIC PROPERTIES SUITABLE TO THE FABRICATION OF EFFICIENT 1.06 MICROMETER PHOTOCATHODES. FURTHER OPTIMIZATION OF THIS MATERIAL AND THE FABRICATION AND TESTING OF COMPLETE PHOTOCATHODES DEVICES WILL BE THE SUBJECT OF PHASE II.

SPIRE CORP.  
PATRIOTS PARK  
BEDFORD, MA 01730  
BRIAN W. MURRAY  
TITLE:

SDIO

\$ 74,833

NOVEL WAY TO FABRICATE LOW SCATTER, RADIATION HARDENED BE MIRRORS  
T 7 OFFICE:

SPIRE CORPORATION PROPOSES TO DEVELOP A MANUFACTURING PROCESS FOR LOW SCATTER, RADIATION HARDENED Be MIRRORS USING ADVANCED SURFACE MODIFICATION TECHNIQUES. TWO NOVEL TECHNIQUES WILL BE USED TO CREATE A TRULY AMORPHOUS Be SURFACE WHICH IS FIRMLY ATTACHED TO THE SUBSTRATE. SPIRE CORPORATION, A LEADER IN SURFACE MODIFICATION, IS IDEALLY SUITED TO CARRY OUT THIS DEVELOPMENT EFFORT. IN-HOUSE IR OPTICAL AND RADIATION HARDNESS FACILITIES ARE AVAILABLE TO QUALIFY MIRROR SMAPLES TO GOVERNMENT STANDARDS.

SPIRE CORP.  
PATRIOTS PARK  
BEDFORD, MA 01730  
WARD D. HALVERSON, PHD  
TITLE:

SDIO

\$ 74,721

HIGH PERFORMANCE ELECTRICAL INSULATORS FOR SPACE POWER APPLICATIONS  
T 5 OFFICE:

EFFICIENT, RELIABLE HIGH-VOLTAGE INSULATION IN VACUUM IS ESSENTIAL

FISCAL YEAR 1986

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FOR PARTICLE ACCELERATORS, LASER DRIVERS, RADAR SYSTEMS, ELECTRICAL GENERATORS (SOLAR, NUCLEAR OR CHEMICAL) AND ELECTROMAGNETIC GUNS WHICH OPERATE AT HIGH ALTITUDE OR IN SPACE. IN ADDITION TO GOOD HIGH-VOLTAGE STANDOFF, INSULATORS FOR THOSE APPLICATIONS MUST BE LIGHTWEIGHT AND HAVE HIGH MECHANICAL STRENGTH. WE PROPOSE TO ASSESS VACUUM-CAST EPOXIES, COATED WITH A MATERIAL WITH LOW SECONDARY ELECTRON EMISSION YIELD, FOR HIGH-VOLTAGE INSULATORS IN VACUUM APPLICATIONS. THESE EPOXIES, WHICH SPIRE USES ROUTINELY IN HIGH-VOLTAGE EQUIPMENT IN VACUUM, HAVE HIGH DIELECTRIC STRENGTH, GOOD MECHANICAL AND IMPACT STRENGTH, AND CAN BE COATED USING SPUTTERING TECHNIQUES. THE SURFACE FLASHOVER STRENGTH IN VACUUM OF UNCOATED AND COATED EPOXY SAMPLES WILL BE COMPARED TO THAT OF IDENTICAL SAMPLES OF ALUMINA (Al[2]O[3]).

SPIRE CORP. PATRIOTS PARK BEDFORD, MA 01730 BRIAN W. MURRAY TITLE: NOVEL WAY TO MANUFACTURE LOW COST, HARDENED BE MIRRORS T 7 OFFICE:	SDIO	\$ 74,833
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THE TECHNICAL OBJECTIVE OF THIS PROPOSAL IS TO FABRICATE LOW SCATTER, RADIATION HARDENED Be MIRRORS AT LOW COST. THIS WILL BE ACHIEVED BY USING ION IMPLANTATION TO MODIFY THE Be SURFACE BEFORE POLISHING. SURFACE MODIFICATION TECHNIQUES WILL BE OPTIMIZED USING 0.25-INCH DIAMETER SAMPLES. FOUR 1.5-INCH DIAMETER Be MIRRORS WILL BE MANUFACTURED IN PHASE I, WITH CHARACTERIZATION OF EACH PROCESS STEP. IN-HOUSE IR OPTICAL RADIATION HARDNESS TESTING WILL DEFINE THE FEASIBILITY OF THIS APPROACH.

SPIRE CORP. PATRIOTS PARK BEDFORD, MA 01730 STEPHEN N. BUNKER TITLE: SILICON-ON-INSULATOR BY NON-MASS-ANALYZED ION IMPLANTATION T 7 OFFICE:	SDIO	\$ 72,463
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SILICON-ON-INSULATOR TECHNOLOGIES, SUCH AS SILICON-ON-SAPPHIRE, HAVE

FISCAL YEAR 1986

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BEEN SHOWN TO BE ESSENTIAL FOR PROVIDING ISOLATION OF TRANSISTORS FROM SUBSTRATES FOR RADIATION HARDNESS. A PROMISING NEW APPROACH, SEPARATION BY ION IMPLANTED OXYGEN (SIMOX), HAS ALREADY DEMONSTRATED HIGH QUALITY CIRCUITS WITHOUT THE SILICON DEFECTS OFTEN FOUND IN SOS. HOWEVER, THE LOW THROUGHPUT, HIGH COST, AND COMPLEXITY OF LARGE ION IMPLANTERS NEEDED FOR COMMERCIAL EXPLOITATION OF THE TECHNOLOGY IS A MAJOR OBSTACLE. IT IS PROPOSED TO DEMONSTRATE A METHOD TO PRODUCE SIMOX WAFERS WHICH IS APPLICABLE FOR USE IN A LOW COST, NON-MASS-ANALYZED IMPLANTER THAT CAN BE ASSEMBLED USING CONVENTIONALLY AVAILABLE COMPONENTS. THIS APPROACH WOULD PERMIT A SIGNIFICANT COST REDUCTION FOR SILICON-ON-INSULATOR, A MATERIAL THAT HAS ALREADY DEMONSTRATED SUPERIOR PROPERTIES FOR RADIATION HARDNESS.

SPIRE CORP.  
PATRIOTS PARK  
BEDFORD, MA 01730  
J.K. HIRVONEN

SDIO

\$ 74,787

TITLE:

SUPERADHERENT HARD COATINGS BY ION BEAM ENHANCED DEPOSITION

T 11

OFFICE:

THIS PROPOSAL IS TO EXPLOIT THE ACCELERATED DEVELOPMENT OF A NEW TECHNIQUE INVOLVING SIMULTANEOUS ION BOMBARDMENT AND PHYSICAL VAPOR DEPOSITION TERMED ION BEAM ENHANCED DEPOSITION (IBED). INITIAL RESULTS OBTAIN USING THIS TECHNIQUE SHOW IT CAPABLE OF EXHIBITING MANY OF THE ADVANTAGES OF THE ION IMPLANTATION AND ION BEAM MIXING TECHNIQUES (E.G., SUPERIOR ADHESION, PRODUCTION OF UNQUES SURFACE ALLOYS, LOW TEMPERATURE PROCESSING) WITHOUT ANY INHERENT LIMITATIONS ON LAYER THICKNESSES OBTAINED. IT ALSO ALLOWS A DEGREE OF PROCESS CONTROL NOT ACHIEVABLE IN PRESENT PVD OR CVD COATING PROCESSES. SPIRE CORPORATION PROPOSES TO DEVELOP THE IBED TECHNIQUE FOR CREATION OF SUPER ADHERENT HARD COATINGS OF  $\text{HfN}$ ,  $\text{Si(3)N}$ , AND  $\text{Al(2)O(3)}$ . IN THIS APPROACH A THIN LAYER OF MATERIAL (E.G.,  $\text{Hf}$ ) WILL BE EVAPORATED ONTO A SURFACE AND CONCURRENTLY BOMBARDED WITH A STEADY BEAM OF IONS (E.G.,  $\text{N}^+$ ).

SPIRE CORP.  
PATRIOTS PARK  
BEDFORD, MA 01730  
WARD D. HALVERSON

SDIO

\$ 74,851

TITLE:

NEUTRAL PARTICLE BEAM LOCATION, AIMING CALIBRATION AND TARGET HIT IDENTIFICATION

T 1

OFFICE:

THE DETERMINATION OF MISS-VECTOR AND IDENTIFICATION OF HITS ON

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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TARGET BY A NEUTRAL PARTICLE BEAM (NPB) IN SPACE IS A SERIOUS PROBLEM FOR THIS ANTIBALLISTIC MISSILE DEFENSE CONCEPT. THE PROPOSED PROGRAM WILL INVESTIGATE THE USE OF ATMOSPHERIC FLUORESCENCE IN THE ZONE OF BEAM IONIZATION (STRIPPING) BELOW AND BEHIND THE TARGET FOR THIS PURPOSE. THE COLLIMATED ZONE OF ATMOSPHERIC LUMINESCENCE WOULD INDICATE THE RELATIVE POSITIONS OF THE TARGET AND THE BEAM; HITS ON TARGET WOULD BE SIGNALLED BY A STRONG DECREASE OF ATMOSPHERIC EXCITATIONS. THE PROGRAM WILL ESTABLISH LUMINESCENCE SIGNAL LEVELS, SIGNAL/NOISE RATIOS, AND MATHEMATICAL RELATIONSHIPS BETWEEN THEM AND BEAM PARAMETERS, ACCELERATOR PLATFORM AND TARGET LOCATION, RELATIVE VELOCITIES, AND GEOPHYSICAL CONDITIONS.

SPRINGBORN LABS INC 10 SPRINGBORN CTR ENFIELD, CT 06082 WILLIAM HOLLEY TITLE: HEAT SEALABLE SEWING THREAD T 135 OFFICE: NRDC	ARMY	\$ 49,930
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MOST OF THE CP FABRICS UNDER CONSIDERATION BY DOD FOR UNIFORMS CONTAIN A LIQUID BARRIER WHICH IS LAMINATED TO THE UNDERSIDE OF AN OUTER SHELL FABRIC. THIS BARRIER PROVIDES LIQUID WATER AND AGENT RESISTANCE. DURING SEWING, THIS BARRIER BECOMES PERFORATED INVITING PENETRATION BY LIQUID AND VAPOROUS AGENTS AND POSING A HAZARD TO THE SOLDIER. IF THESE PERFORATIONS COULD BE SEALED BY A HOT MELT COATING ON THE THREAD, SUCH PENETRATION COULD BE PREVENTED. THE PURPOSE OF THIS PROPOSED PROGRAM IS TO SCREEN AND EVALUATE COMMERCIALY AVAILABLE HEAT SEALABLE COATING RESINS FOR NYLON AND POLYESTER THREAD FOR THIS PURPOSE. POLYAMIDE, POLYESTER, POLYURETHANE AND POLYOLEFIN HOT MELT RESINS WILL BE EVALUATED. THE MOST PROMISING WILL BE APPLIED TO THREAD WHICH WILL BE USED TO SEW AND SEAL BARRIER/SHELL FABRIC LAMINATES. SEWN AND SEALED LAMINATES WILL BE SUBJECTED TO HYDROSTATIC PRESSURE TESTING. COATED THREAD WILL ALSO BE CHECKED FOR AGENT AND WATER RESISTANCE, STIFFNESS AND TACKINESS BEFORE AND AFTER HEAT SEALING.

SPRINGBORN LABS INC 10 SPRINGBORN CTR ENFIELD, CT 06082 WILLIAM H HOLLEY TITLE: IMPROVED MOISTURE-RESISTANT POTTING MATERIALS/TECHNIQUES FOR IMAGE INTENSIFIERS T 64 OFFICE: CECOM/AMSEL	ARMY	\$ 49,930
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IMAGE INTENSIFIER TUBE ASSEMBLIES ARE EXPERIENCING FAILURE DUE TO

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>LEAKAGE CURRENTS ALONG THE GLASS/POTTANT INTERFACE. IN MOIST ENVIRONMENTS, WATER PENETRATES THE RTV SILICONE TO THIS INTERFACE, RESULTING IN LEAKAGE CURRENTS LARGE ENOUGH TO OVERWHELM THE POWER SUPPLY. THIS FAILURE IS BEING AGGREGATED BY POOR COUPLING (ADHESION) BETWEEN THE GLASS AND THE SILICONE POTTANT, HYDROPHILIC Si-OH GROUPS AT THE SURFACE OF THE GLASS, AND POSSIBLY BY RESIDUAL CURE BY-PRODUCTS IN THE CONDENSATION-TYPE RTV BEING USED. THIS PHASE I PROGRAM WILL INVESTIGATE SILANE-BASED COUPLING AGENTS AND PRIMERS TO REACT WITH THE Si-OH GROUPS AND RENDER THEM HYDROPHOBIC AND TO ENHANCE ADHESION BETWEEN THE GLASS AND POTTANT. THIS PROJECT WILL ALSO EVALUATE ADDITION-CURE TYPE RTV SILICONES AND ALSO EVA RESINS AS POTTANTS LOW IN BY-PRODUCTS AND LESS SENSITIVE TO A MOIST ENVIRONMENT. THE MOST PROMISING COUPLING AGENT/POTTANT SYSTEMS WILL BE USED TO POT INTENSIFIER TUBE ASSEMBLIES WHICH WILL BE SUBJECTED TO HIGH RELATIVE HUMIDITY AND MONITORED FOR INTENSIFIER OPERATION. THE MOST PROMISING POTTANT SYSTEM WILL BE RECOMMENDED TO THE COMMUNICATION-ELECTRONICS COMMAND FOR MORE EXTENSIVE TESTING.</p>		

SPRINGBORN LABS INC  
10 SPRINGBORN CTR  
ENFIELD, CT 06082  
W ROBERT DIEHL

ARMY

\$ 49,656

## TITLE:

REPLACEMENT MATERIAL FOR NYLON 6/6 FOR AMMUNITION APPLICATIONS  
T 26 OFFICE: ARDC/SMCAR

AMMUNITION COMPONENTS MOLDED IN NYLON 6/6 ARE SUSCEPTIBLE TO CHANGES IN PERFORMANCE FOLLOWING STORAGE IN HIGH HUMIDITY AND TEMPERATURE ENVIRONMENTS. THIS IS DUE TO THE MOISTURE ABSORPTION CHARACTERISTICS OF THIS MATERIAL, WHICH AFFECTS DIMENSIONS AND MECHANICAL PROPERTIES. FURTHER, INTIMATE CONTACT WITH PROPELLANTS AND EXPLOSIVES FOR EXTENDED PERIODS HAS BEEN SHOWN TO AFFECT PERFORMANCE. A SEARCH WILL BE CONDUCTED FOR REPLACEMENT THERMOPLASTIC MATERIALS WITH MECHANICAL PROPERTIES SIMILAR TO DRY-AS-MOLDED NYLON 6/6, BUT WITH REDUCED SENSITIVITY TO ENVIRONMENTAL HUMIDITY AND IMPROVED RESISTANCE TO EXPOSURE TO EXPLOSIVES AND PROPELLANTS. ENGINEERING PLASTIC MATERIAL CANDIDATES WILL BE SELECTED AND RANKED ACCORDING TO PERFORMANCE IN TESTS OF MECHANICAL PROPERTIES AT A RANGE OF TEMPERATURES AND HUMIDITY. SHORT-TERM DATA ON COMPATIBILITY WITH EXPLOSIVES AND PROPELLANTS FOR THESE CANDIDATES WILL BE OBTAINED WITH ASSISTANCE FROM ARDC PERSONNEL, AND WILL BE USED TO MAKE FINAL ASSESSMENTS OF SUIT-

FISCAL YEAR 1986

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ABILITY FOR USE IN AMMUNITION APPLICATIONS.

SPUTTERTEX CORP	AF	\$ 49,909
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10575 NEWKIRK - STE 790

DALLAS, TX 75220

B L JUSTICE

TITLE:

PHOTOCHROMIC ELECTRICAL AND THERMAL PROPERTIES OF FLUID FILLED  
TRANSPARENCIES

T 141

OFFICE: AFWAL/FI

PROTOTYPES OF MULTILAMINATE TRANSPARENCIES HAVING A CLOSED FLUID COUNTERCURRENT FLOW CIRCULATING SYSTEM WITH A THERMOELECTRIC SYSTEM WILL BE ADAPTED IN SEVERAL WAYS TO ACHIEVE: 1) PROTECTION AGAINST INCIDENT IR. 2) REGULATION OF INNER TRANSPARENCY SURFACE TEMPERATURE. 3) DYNAMIC RESPONSIVENESS TO INTENSE INCANDESCENT FLASH. 4) SURFACE PROTECTION AGAINST LASER INDUCED OPACIFICATION OF TRANSPARENCY. 5) POTENTIAL INDUCTION IN EMP PASSAGE. EVALUATION OF PERFORMANCE OF TRANSPARENCIES WILL BE DONE IN BLACK BOX SYSTEMS WITH THERMAL PROBES ON AN OPTICAL BENCH WITH APPROPRIATE SENSORS, AND LASERS. THERMAL REGULATION WILL BE DONE WITH THERMOELECTRIC MODULES MOUNTED ON FLUID SUPPLY LINES USING THERMOCOUPLED FEED BACK. THERMOELECTRIC DEVICES CAN ACHIEVE BOTH RAPID HEATING AND/OR COOLING WITH THE ADVANTAGE OF BEING DONE ELECTRONICALLY. PHOTOCHROMIC MATERIALS WILL BE EVALUATED FOR FLASH PROTECTION USE. THOSE DIFFERENT TYPES OF PHOTODYNAMIC RESPONDERS WILL BE STUDIED FOR UTILIZATION IN THIS SYSTEM: 1) PHOTOCHROMIC RESPONDERS. 2) FARADAY EFFECT DEPENDENT RESPONDERS. 3) CHARGE INJECTION RELATED RESPONDERS. RADIO FREQUENCY SPUTTERING AND MAGNETRON SPUTTERING WILL BE USED TO GENERATE PROTECTIVE AND RESPONSIVE FILMS. FLUID FLOW CHARACTERISTIC WILL BE ESTABLISHED AND THE EFFECTIVENESS OF CIRCULATING FLUIDS AND PHOTOCHROMES WILL BE COMPARED WITH MATRIX FIXED SURFACE FILMS.

SRS TECHNOLOGIES	SDIO	\$ 49,999
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555 SPARKMAN DR., SUITE 1406

HUNTSVILLE, AL 35816

RICHARD D. KRAMER, PHD

TITLE:

ANNULAR FLOW ELECTROTHERMAL PLUG RAMJET INVESTIGATION AS A  
HYPERVELOCITY PROJECTILE LAUNCHER

T 2

OFFICE:

A NEW SYSTEM, THE ANNULAR FLOW ELECTROTHERMAL PLUG RAMJET, IS PRO-

FISCAL YEAR 1986

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POSED AS A ALTERNATIVE TO CHEMICAL ROCKETS AND ELECTROMAGNETIC LAUNCHERS AS A KINETIC ENERGY WEAPON. THIS SYSTEM APPEARS TO BE CAPABLE OF ACHIEVING THE HYPERVELOCITIES NECESSARY IN REASONABLE LAUNCHER LENGTHS, PRIMARILY BECAUSE IT DOES NOT ACCELERATE EITHER THE PROPELLANT OR THE PROPULSION SYSTEM REQUIRED TO ACHIEVE HYPERVELOCITIES. THE OBJECTIVES OF THIS EFFORT WILL BE THE DEVELOPMENT OF KINEMATIC PERFORMNCE REQUIREMENTS FOR HYPERVELOCITY PROJECTILES, WHICH WILL BE USED TO DEFINE SYSTEMS DESIGN AND SUPPORT SUBSYSTEM TECHNOLOGY REQUIREMENTS. OVERALL SYSTEM TECHNOLOGY DEVELOPMENT REQUIREMENTS WILL ALSO BE IDENTIFIED.

SRS TECHNOLOGIES 555 SPARKMAN DR - STE 1406 HUNTSVILLE, AL 35816 JEFFREY S YALOWITZ TITLE: FAULT TOLERANT SYSTEM DESIGN AND EVALUATION ALGORITHMS T 83 OFFICE: NAVAIR	NAVY	\$ 49,900
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THE OBJECTIVE OF THIS RESEARCH IS TO INVESTIGATE NEW FAULT TOLERANT ALGORITHMS AND MODELING ENVIRONMENTS FOR USE IN RELIABILITY DESIGN AND EVALUATION OF MODEL MULTIPROCESSOR NETWORKS SUCH AS FLIGHT CONTROL SYSTEMS AND HIGH-RELIABILITY COMPUTER SYSTEMS FOR NUCLEAR PLANT SAFETY SYSTEMS AND OTHER MISSION-CRITICAL WEAPON PLATFORM COMPUTERS. EMPHASIS IS PLACED ON FAULT TOLERANCE RELATED TECHNIQUES WHICH ARE OFTEN USED IN COMPUTER NETWORKS APPLICABLE AT MULTIPLE LEVELS (E.G., CIRCUIT CARD, EQUIPMENT, SYSTEM). COMPUTATIONALLY EFFICIENT ALGORITHMS WILL BE INVESTIGATED AND EXAMPLE ALGORITHMS DESIGNED. THE INNOVATIVE ALGORITHM EVALUATION TECHNIQUE EMPLOYS AN AUTOMATED DYNAMIC NETWORK MODELING SYSTEM TO SYSTEMATICALLY ACCOMMODATE CONFIGURATION CHANGES THAT MAY OCCUR OVER TIME BECAUSE OF FAULT TOLERANCE. SYSTEM ELEMENTS AND TOPOLOGY FEATURES ARE CONSTRUCTED FROM STORED TEMPLATES WHICH PROVIDE CANONICAL REPRESENTATIONS OF COMPUTATION, COMMUNICATIONS AND FAULT TOLERANCE PROCESSES. RANDOM PROCESSES AND I/O FUNCTIONS ARE TREATED STATISTICALLY WHERE PRACTICAL, USING MOMENTS, CORRELATIONS, AND PROBABILITY DISTRIBUTIONS AS NEEDED, TO MAXIMIZE COMPUTATIONAL EFFICIENCY. MONTE CARLO TREATMENT OF RANDOM FUNCTIONS PROVIDES BACKUP UTILITY IN DEVELOPMENT OF THE STATISTICAL RELATIONSHIPS TO BE USED.



FISCAL YEAR 1986

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SRS TECHNOLOGIES 555 SPARKMAN DR - STE 1406 HUNTSVILLE, AL 35816 DR RICHARD D KRAMER TITLE: THIN FILM CREEP-FORMING FOR SOLAR PROPULSION APPLICATIONS REQUIREMENTS T 77	AF	\$ 49,148
OFFICE: AFRPL/TSTR		

THE HIGH PERFORMANCE POTENTIAL OF COMPOSITE PROPULSION SYSTEMS MAKE THEM ATTRACTIVE FOR WINGED HORIZONTAL TAKE-OFF BOOSTER AND SINGLE STAGE TO ORBIT LAUNCH VEHICLES. NUMEROUS TYPES OF SYSTEMS HAVE BEEN PROPOSED, RESEARCHED, ANALYZED, AND TESTED. THE OVERALL OBJECTIVE OF THIS EFFORT IS A CRITICAL EXAMINATION OF PAST STUDIES AND ANALYSES TO IDENTIFY PROMISING CONCEPTS FOR TECHNOLOGY DEVELOPMENT FOR BOTH NEAR AND FAR-TERM APPLICATIONS.

SRS TECHNOLOGIES 555 SPARKMAN DR - STE 1406 HUNTSVILLE, AL 35816 GARY LEE ROBBINS TITLE: DECISION SUPPORT SYSTEM - MUNITIONS DEVELOPMENT T 141	ARMY	\$ 48,500
OFFICE: LABCOM/BRL		

THE OBJECTIVE OF THIS RESEARCH IS TO DEVELOP A PROTOTYPE DECISION SUPPORT SYSTEM (DSS) THAT WILL SUPPORT MUNITIONS DEVELOPMENT EFFORTS AND FACILITATE THE "DESIGNED TO REDUCE THE LOGISTICS BURDEN" GOAL OF THE INTEGRATED LOGISTICS SUPPORT PROGRAM. THE DSS ENVISIONED IS INTENDED FOR USE BEGINNING AT THE PROGRAM INITIATION STAGE AND CONTINUING THROUGH THE LIFE OF THE MATERIEL ACQUISITION PROCESS. A KEY GOAL OF THE DSS IS TO SUPPORT THE ENGINEERING AND LOGISTICIAN STAFFS DURING THE PRE-MILESTONE I PHASE. THE SUPPORT PROVIDED WILL LEAD TO THE EARLY IDENTIFICATION OF CHARACTERISTICS THAT CAN BE "ENGINEERED INTO OR OUT OF" THE PROPOSED SYSTEM SO AS TO REDUCE OR MINIMIZE THE LIFE CYCLE SUPPORT REQUIREMENTS FOR THE MUNITION SYSTEM. A CONCOMITANT GOAL OF THIS EFFORT IS TO DEVELOP A DSS SYSTEM THAT IS DRIVEN BY THE USERS NEEDS. TOWARD THIS END THE DSS DEVELOPED IN PHASE I WILL BE GENERIC AND BASED ON THE SET OF VARIABLES APPLICABLE TO THE "FAMILY" OF POTENTIAL USERS. THIS PROTOTYPE MODEL WILL THEN SERVE AS THE BASELINE MODEL FOR DEVELOPMENT OF SPECIFIC DSS (SDSS) AND

FISCAL YEAR 1986

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DSS GENERATORS IN PHASE II. DURING PHASE II THE SPECIFIC USER NEEDS WILL BE ADDRESSED AND ACCOMMODATED.

SRS TECHNOLOGIES 555 SPARKMAN DR - STE 1406 HUNTSVILLE, AL 35816 DR D DAVID MARSHALL TITLE: CREATION OF A DATA BASE ON ENERGETIC MATERIALS T 9 OFFICE: ARDC/SMCAR	ARMY	\$ 49,999
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THE OBJECTIVE OF THIS RESEARCH IS TO DETERMINE THE FEASIBILITY OF ESTABLISHING AN AUTOMATED DATA BASE AND RETRIEVAL SYSTEM WHICH CONTAINS A BROAD CROSS SECTION OF INFORMATION ON ENERGETIC MATERIALS. SUCH A DATA BASE DOES NOT CURRENTLY EXIST. THE DATA BASE FILE STRUCTURE WILL INCLUDE MATERIALS PHYSICAL AND MECHANICAL PROPERTIES. THE SYSTEM IS FOCUSED TOWARD SERVING CHARGE DESIGNERS AND WILL BE DESIGNED TO PERMIT EXPANSION OVER TIME AS ADDITIONAL DATA BECOMES AVAILABLE. VARIOUS FILE STRUCTURES AND QUERY PROCEDURES WILL BE ASSESSED TO IDENTIFY FLEXIBLE APPROACHES TO PROVIDE ACCESS TO MATERIALS PROPERTIES, TEST DATA, AND SYSTEM APPLICATIONS. THE DATA BASE DESIGN WILL PERMIT REMOTE TERMINAL AND CENTRAL SITE DATA INTERROGATION AND MULTIPLE OUTPUT OPTIONS.

SSUNNOL INC 105 W OHIO COALGATE, OK 74538 DR JOHN J SHELTON TITLE: EXPAND NEW BONDED SEAM TECHNOLOGY IN THE ASSEMBLY OF GARMENTS - RESEARCH DESIGN STUDY T 71 OFFICE: NAVSUP	NAVY	\$ 49,769
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SSUNNOL INC. IS PRESENTLY USING ITS PATENTED TECHNOLOGY OF INJECTION SEAM TO PRODUCE LIGHT WEIGHT COTTON GLOVES FOR THE U.S. NAVY, TVA, AND OTHER NUCLEAR POWER PLANT OPERATORS. FIVE MILLION PAIRS HAVE BEEN PRODUCED SINCE 1984, WITH 8 MILLION ON BACKLOG. AN INDIVIDUAL GLOVE CAN BE PRODUCED IN ONE SECOND AS COMPARED TO 30 SECONDS BY STITCHING. PRINCIPAL PURPOSE OF THE PROPOSED DESIGN STUDY WILL BE TO DEVISE MANUFACTURING METHODS FOR INJECTION SEAM BONDING TO JOIN

FISCAL YEAR 1986

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PIECES IN A PRE-DETERMINED SEQUENCE TO FORM A FINISHED GARMENT. IN ADDITION TO THE ASSEMBLY PROCESS, EFFORTS WILL BE MADE TO RESEARCH AND CLASSIFY A FAMILY OF LATEX-TYPE BONDING COMPOUNDS, AS TO THEIR PHYSICAL AND CHEMICAL PROPERTIES. PRESENT METHOD OF CURING THE INJECTED SEAM UTILIZES AN INFRARED CONVEYER TUNNEL WHICH IS THOUGHT TOO ENERGY-INTENSIVE AND TIME CONSUMING. RESEARCH WILL BE CONDUCTED ON THE USE OF MICROWAVE, DIELECTRIC, AND LASER TO REDUCE DWELL TIME AND ENERGY CONSUMPTION. INCLUDED WILL BE AN ANALYSIS OF THE MANUFACTURING ECONOMICS AS IT COMPARES TO CONVENTIONAL GARMENT ASSEMBLY PRACTICES AND WILL SHOW THE DEGREE OF FEASIBILITY OF THREE-DIMENSIONAL ASSEMBLY IN, (1) MANUFACTURING METHODS, (2) PHYSICAL AND CHEMICAL PROPERTIES OF BONDING SEAMING, AND (3) RAPID AND ECONOMICAL CURING.

STANFORD TELECOMMUNICATIONS INC

AF

\$ 48,639

6888 ELM ST

MCLEAN, VA 22101

WILLIAM M WILKINSON

TITLE:

A CONTINUOUS REAL TIME EMPTY EXPERT SYSTEM DESIGN

T 66

OFFICE: AFSTC/OLAB

EXPERT SYSTEM TECHNOLOGY IS GROWING RAPIDLY. COMMERCIALY AVAILABLE PACKAGES (GENERAL PURPOSE INFERENCE ENGINES, KNOWLEDGE/DATA REPRESENTATION SCHEMES AND DEVELOPMENT ENVIRONMENTS) ARE MULTIPLYING. CUSTOM REAL-TIME EXPERT SYSTEMS ARE NOW BEING FIELDDED. REAL-TIME FEATURES ARE BEING ADDED TO GENERAL PURPOSE PACKAGES. MAJOR STUMBLING BLOCKS STILL LIE IN INTER-SYSTEM COMMUNICATION, THE ALLOCATION OF LARGE TASKS TO MULTIPLE PROCESSORS AND PERFORMANCE. PERFORMANCE OF COMMERCIALY AVAILABLE PACKAGES IS IMPROVING. THE COST-EFFECTIVENESS OF COMMERCIAL PACKAGES MAKES CUSTOM DEVELOPMENT OF EXPERT SYSTEM SHELLS DIFFICULT TO JUSTIFY FOR MOST APPLICATIONS. THIS PROPOSAL ADDRESSES THE PROBLEMS OF 1) MOVING REAL-TIME DATA TO/FROM MULTIPLE EXPERT SYSTEMS AND 2) GIVING THE APPLICATION PROGRAMMER FREEDOM TO EXPERIMENT EASILY WITH MESSAGE PRIORITIES AND TASK PRIORITIES/ALLOCATION. THE KEY TO THIS PROPOSED CONCEPT IS DESIGN OF A SET OF SOFTWARE TOOLS TO BE MADE AVAILABLE TO THE APPLICATION PROGRAMMER IN A MULTITUDE OF ENVIRONMENTS. THIS ALLOWS HIM TO DESIGN PRIORITIZED MESSAGES BETWEEN EXPERT SYSTEM AND REAL-TIME PROCESSES WITHOUT CONCERN FOR THE DETAILS OF IMPLEMENTATION. THIS ALSO FREES HIM TO CHOOSE THE BEST SHELL, PACKAGE OR CUSTOM SOFTWARE FOR EACH PIECE OF

FISCAL YEAR 1986

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A PROBLEM.

STATCO INC 2208 COUNTRYSIDE DR SILVER SPRING, MD 20904 DR MARK J BERAN TITLE: PHASED ARRAY IMAGING IN PARTIALLY COHERENT LIGHT T 83 OFFICE: AFWL/PRC	AF	\$ 63,445
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WE PROPOSE TO DEVELOP A MATHEMATICAL MODEL AND ASSOCIATED NUMERICAL CODE WHICH WILL PERMIT DETERMINATION OF THE IMAGING PROPERTIES OF A PHASED-ARRAY TELESCOPE IN THE PRESENCE OF PARTIALLY-COHERENT LIGHT. THIS FORMULATION WILL INCLUDE COHERENCE EFFECTS INTRODUCED BY LONG PROPAGATION PATHS AND THE EFFECT OF COHERENCE LOSS THAT OCCURS AS A RESULT OF ATMOSPHERIC TURBULENCE. SIMPLIFIED EXPRESSIONS FOR THE AMPLITUDE IMPULSE RESPONSE OF SUCH TELESCOPES WILL BE DEVELOPED IN TERMS OF THE FREESPACE GREEN'S FUNCTION AND THE APERTURE PHASE SHIFTS. TO ILLUSTRATE THE DEVELOPED THEORY, THE IMAGE OF A RECT-ANGULAR SOURCE WILL BE COMPUTED WHEN THE RADIATION EMITTED BY THE SOURCE IS PARTIALLY COHERENT. FINALLY, WE SHALL SHOW HOW THE THEORY CAN BE GENERALIZED TO INCLUDE FOURTH-ORDER COHERENCE EFFECTS, AND THUS TO ENABLE US TO CALCULATE THE STATISTICAL FLUCTUATIONS OF THE IMAGE.

STATCON, INC. 2208 COUNTRYSIDE DR. SILVER SPRING, MD 20904 AMR M. BAZ, PHD TITLE: FLEXIBLE SPACE STRUCTURES ACTIVE CONTROL USING THE NITINOL SHAPE MEMORY ACTUATOR T 11 OFFICE:	SDIO	\$ 56,219
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THIS PROPOSAL DEALS WITH THE UTILIZATION OF A NEW CLASS OF SHAPE MEMORY ACTUATORS IN CONTROLLING AND SUPPRESSING THE VIBRATIONS OF FLEXIBLE STRUCTURES. THE NEED FOR SUCH ACTIVE CONTROL SYSTEMS IS BECOMING INEVITABLE BECAUSE THE NEW TRENDS IN STRUCTURAL DESIGNS HAVE RENDERED THE STRUCTURES TO BE MECHANICALLY FLEXIBLE AND INHERENTLY LOW IN NATURAL DAMPING. THE PROPOSED STUDY WILL AIM AT INVESTIGATING

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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EXPERIMENTALLY THE FEASIBILITY OF USING THE SHAPE MEMORY ACTUATORS IN CONTROLLING ACTIVELY THE VIBRATION OF SIMPLE STRUCTURAL ELEMENTS. EMPHASIS WILL BE PLACED ON THE MEASUREMENTS OF THE DYNAMIC CHARACTERISTICS OF DIFFERENT CONFIGURATIONS OF THE SHAPE MEMEORY ACTUATOR IN THE TIME AND FREQUENCY DOMAINS AT NO-LOAD AS WELL AS UNDER VARIOUS LOAD LEVELS. CLOSED-LOOP COMPUTER-CONTROLLED SYSTEM WILL BE DESIGNED; BASED ON THE OBTAINED DYNAMIC CHARACTERISTICS OF THE ACTUATORS, TO PERFORM SUCH AN ACTIVE CONTROL FUNCTION. THE PERFORMANCE OF THE CONTROL SYSTEM WILL BE EVALUATED WHEN SUBJECTED TO VARIOUS TYPES OF DISTRUBANCES IN AN ATTEMPT TO DETERMINE ITS CAPABILITIES WHILE CONSIDERING VARIOUS CONTROL STRATEGIES.

STD RESEARCH CORP  
PO BOX C  
ARCADIA, CA 91006  
C D MAXWELL

NAVY \$ 44,924

TITLE:  
MHD POWER PLANT AND STORAGE SYSTEM FOR AN ELECTROMAGNETIC AIRCRAFT LAUNCHER

T 161 OFFICE: NAVAIR

UNDER AN ON-GOING NAVY PROGRAM, STD RESEARCH CORPORATION HAS DEMONSTRATED A PORTABLE, T Mw SELF-EXCITED MAGNETOHYDRODYNAMIC (MHD) POWER GENERATOR THAT IS INHERENTLY SAFE, LIGHTWEIGHT, INEXPENSIVE, RELIABLE, STORABLE, RESTARTABLE, INSTANTLY AVAILABLE, AND SELF-CONTAINED. THE PERFORMANCE AND CAPABILITIES DEMONSTRATED IN THE INITIAL TESTS OF THIS GENERATOR ARE ADEQUATE TO DESIGN A 70MW POWER PLANT AND STORAGE SYSTEM THAT EASILY EXCEEDS THE REQUIREMENTS FOR ELECTROMAGNETIC AIRCRAFT LAUNCHERS ON NAVAL AIRCRAFT CARRIERS. IN PHASE I OF THE PROPOSED PROGRAM STD RESEARCH CORPORATION WILL PERFORM CONCEPTUAL DESIGNS OF SUCH MHD POWER PLANTS AND STORAGE SYSTEMS BASED ON THE DEMONSTRATED AND THE EXPECTED ULTIMATE PERFORMANCE OF THE PROTOTYPE MHD SYSTEM. THE CHARACTERISTICS OF THE RESULTING SYSTEMS WILL BE COMPARED WITH THOSE OF OTHER CANDIDATE SYSTEMS AND RECOMMENDATIONS WILL BE FORMULATED FOR POSSIBLE GENERATING AND STORAGE SYSTEMS AND NAVAL USE.

STRAINOPTIC TECHNOLOGIES INC  
21 TERRACE RD  
NORRISTOWN, PA 19401  
ALEX S REDNER

NAVY \$ 49,450

TITLE:  
EVALUATION OF SPOT-WELDED SANDWICH PANELS USING DIGITALLY-ANALYZED SHADOW MOIRE FRINGE PATTERNS

T 186 OFFICE: NSRDC

AN IMPERFECT SPOT-WELDED JOINT WILL LOCALLY CHANGE THE MECHANICAL

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>PROPERTIES AND PRODUCE AN ANOMALOUS STRUCTURAL RESPONSE. THIS LOCAL CHANGE IN THE DISPLACEMENT FIELD WILL BE OBSERVED, RECORDED AND ANALYZED USING THE NEW APPROACH, PROPOSED HERE. A COMBINATION OF A SHADOW-MOIRE USED FOR FIELD ACQUISITION OF SURFACE DISPLACEMENTS TOPOGRAPHY AND DIGITAL IMAGE ANALYSIS. A SOPHISTICATED SOFTWARE WILL BE DEVELOPED TO ANALYZE THE RECORDED SURFACE-DISPLACEMENT PATTERN, AND COMPARE TO THE "NORMAL" DISPLACEMENT BEHAVIOR. TO ASCERTAIN THE FEASIBILITY AND MERITS OF THE PROPOSED APPROACH, SPECIMEN CONTAINING BAD WELDS WILL BE EXAMINED AND DEFECT DETECTION ABILITY EVALUATED.</p>		

STRAT CO	AF	\$ 48,858
4597 JUPITER DR		
SALT LAKE CITY, UT 84124		
JOHN DOWNEN		
TITLE:		
ADVANCED JET FUEL FROM COAL TARS		
T 183	OFFICE: AFWAL/PO	

THE OBJECTIVE OF THIS EFFORT WOULD BE TO EVALUATE THE TECHNICAL AND ECONOMIC FEASIBILITY OF PRODUCING HIGH ENERGY JET FUEL OR JET FUEL COMPONENTS FROM COAL TARS. PROCESS CONDITIONS WILL BE DETERMINED AND RELATED TO FUEL QUALITY AND COST. COAL TARS ARE READILY AVAILABLE FROM SEVERAL PROCESSES AND ARE OF VALUE AS A SOURCE OF FUEL BY THEMSELVES OR AS REPRESENTATIVES OF THE CLASS OF CYCLIC HYDROCARBONS.

STRATEGIC UNIVERSITY RESOURCES	ARMY	\$ 49,830
31 DIVISION AVE		
SOUTH NYACK, NY 10960		
LYNN PENN		
TITLE:		
REDUCED DAMAGE ACCUMULATION THROUGH SHRINKAGE CONTROL		
T 131	OFFICE: LABCOM/MTL	

WE PROPOSE TO INVESTIGATE THE EFFECT OF REVERSING THE CURE SHRINKAGE, AND THEREBY REDUCING THE RESIDUAL STRESSES, ON THE DAMAGE ACCUMULATION IN GRAPHITE/EPOXY COMPOSITES. THE PROPOSED PROGRAM IS BASED ON COMPARISON OF RESIDUAL STRESSES AND DAMAGE ACCUMULATION BEHAVIOR IN EXPERIMENTAL COMPOSITES WITH THAT IS CONTROL COMPOSITES. THE CONTROL COMPOSITE, WHOSE PROPERTIES SERVE AS THE REFERENCE, IS GRAPHITE FIBER COMPOSITE WITH A HEAT-CURABLE EPOXY RESIN MATRIX. THE EXPERIMENTAL

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>COMPOSITE, WHOSE DAMAGE RESISTANCE IS EXPECTED TO BE IMPROVED, IS THE SAME AS THE CONTROL EXCEPT FOR THE ADDITION TO THE MATRIX OF A SMALL AMOUNT OF THERMALLY STABLE POLYMER THAT EXPANDS RATHER THAN SHRINKS ON CURE. THE TECHNICAL OBJECTIVE FOR PHASE I ARE TO FIRST DEMONSTRATE A DIFFERENCE IN COMPOSITE LAMINATE RESIDUAL STRESSES BETWEEN THE EXPERIMENTAL AND CONTROL LAMINATES, AND TO NEXT DEMONSTRATE A RESISTANCE TO DAMAGE ACCUMULATION ON THE PART OF EXPERIMENTAL LAMINATES VERSUS THE CONTROL LAMINATES.</p>		

STRAUSS PHOTO-TECHNICAL SERVICE INC 1240 MOUNT OLIVE RD NE WASHINGTON, DC 20002 ZOLTAN KOCSIS TITLE: RUGGEDIZED GATED VIDEO CAMERA - ENGINEERING DEVELOPMENT T 182 OFFICE: TECOM/CSTA	ARMY	\$ 45,879
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AN IMPROVED GATED VIDEO CAMERA WILL BE DEVELOPED AND RUGGEDIZED TO PERMIT THE ACQUISITION OF WEAPON POINTING ERRORS ON STABILIZED VEHICLE MOUNTED WEAPON SYSTEMS IN A HIGH SHOCK AND VIBRATION FIELD ENVIRONMENT. IMPROVEMENTS OVER EXISTING GATED CAMERAS WILL BE IN THE AREAS OF PHYSICAL SIZE AND WEIGHT, SENSITIVITY, RESOLUTION, LINEARITY, AND DYNAMIC RANGE. VIDEO SIGNAL INTERFACING WILL BE COMPATIBLE WITH EXISTING DIGITAL DATA ACQUISITION AND TRACKING ERROR PROCESSOR HARDWARE EMPLOYED BY THE ARMY.

STRUCTURAL INTEGRITY ASSOCS INC 3150 ALMADEN EXPY - STE 226 SAN JOSE, CA 95118 DR AN-YU KUO TITLE: STRESS INTENSITY FACTORS FOR CRACKING METAL STRUCTURES UNDER RAPID THERMAL LOADING T 136 OFFICE: AFWAL/F1	AF	\$ 49,246
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THIS WORK PROPOSED TO COMBINE A NOVEL METHOD OF DIRECT INTEGRATION OF THERMAL STRESSES VIA GREEN'S FUNCTIONS, WITH AN EXISTING TECHNOLOGY FOR CALCULATING CRACK TIP STRESS INTENSITY FACTORS, TO DEVELOP A FAST AND EFFICIENT MEANS OF PREDICTING STRESS INTENSITY FACTORS OF CRACKED METALLIC STRUCTURES SUBJECTED TO RAPID THERMAL PULSES. THE

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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END PRODUCT WILL BE A PERSONAL COMPUTER BASED SOFTWARE PACKAGE, SPECIFICALLY FOCUSED TO AIR FORCE THERMAL CRACKING PROBLEMS, WHICH IS MENU-DRIVEN, USER FRIENDLY, AND WHICH POSSESSES EXTENSIVE INTER-ACTIVE GRAPHICS CAPABILITIES. A UNIQUE FEATURE OF THE PROPOSED METHOD IS ITS ABILITY TO PREDICT STRESS INTENSITY FACTOR TIME-HISTORIES FROM NON-LINEAR THERMAL STRESS DISTRIBUTIONS, WHICH OCCUR FROM RAPID THERMAL PULSES, WITHOUT THE NEED TO RESORT TO TIME CONSUMING FINITE ELEMENT MODELING OF EACH AND EVERY CASE TO BE ANALYZED. THE CRACKED-STRUCTURE GEOMETRIES OF INTEREST ARE ANALYZED JUST ONCE, AND THE RESULTS ARE THEN EXTENDED TO ANY LOADING CASE OF INTEREST.

SULLIVAN MINING CORP.

SDIO

\$ 49,806

P.O. BOX 4615

SAN DIEGO, CA 92104

DAVE RICHERSON

TITLE:

COATED-FIBER REINFORCED CERAMICS

T 11 OFFICE:

FIBER REINFORCED CERAMICS WITH HIGH COMPOSITE TRANSLATIONAL EFFICIENCY WILL BE SIGNIFICANTLY STRONGER, TOUGHER, HIGHER IN WEI-BULL, MORE CREEP RESISTANT, AND MORE RESISTANT TO THERMAL SHOCK AND CYCLING THAN MONOLITHIC CERAMICS. PAT. PEND. SULLIVAN FIBER COATINGS WILL PROVIDE EFFICIENT COMPOSITE TRANSLATION. RT STRENGTHS 716 MPa TO 1246 MPa AND 1000 DEG C STRENGTHS OF 542 MPa TO 1200 MPa ARE ANTICIPATED. THERMAL SHOCK PARAMETER OF THE MATRIX WILL INCREASE 320%.

SUPER/RADIANT SYSTEMS, INC.

SDIO

\$ 49,674

P.O. BOX 417, BRASSWORKS BLDG.

HAYDENVILLE, MA 01039

LAWRENCE H. DOMASH, PHD

TITLE:

SPACE BASED FLUCTUATION INTERFEROMETERS FOR EXTREMELY HIGH RESOLUTION OPTICAL SENSING

T 1 OFFICE:

INTENSITY FLUCTUATION CORRELATION INTERFEROMETRY, A PHASE INDEPENDENT SYNTHETIC APERTURE TECHNIQUE INVENTED BY RADIO/OPTICAL ASTRONOMERS HANBURY-BROWN AND TWISS IN 1957, IS PROPOSED AS THE BASIS OF A NEW FAMILY OF SPACE-BASED SENSORS OF EXTREMELY HIGH ANGULAR RESOLUTION



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>FOR SDIO APPLICATIONS TO DETECTION OF LAUNCHERS OR LASERS. TWO NOVEL IMPLEMENTATIONS FOR SATELLITE BASING ARE PROPOSED, A FIBER-OPTIC IMPLEMENTATION WITH BASELINES UP TO 1 KM AND AN INDEPENDENT MOVING DETECTOR IMPLEMENTATION WITH MUCH LONGER BASELINES. ANGULAR RESOLUTIONS FROM <math>10\text{EXP}(-9)</math> TO <math>10\text{EXP}(-13)</math> RADIANS MAY BE POSSIBLE. APPLICATIONS ARE DISCUSSED TO THE SURVEILLANCE, DISCRIMINATION, TRACKING, POINTING AND BEAM-STEERING MISSIONS.</p>		

SURFACE OPTICS CORP PO BOX 261602 - 9929 HIBERT ST/STE C SAN DIEGO, CA 92126 MARTIN BRESSLER TITLE: MODELING TECHNIQUES FOR IR IMAGE INTERPRETATION APPLICATIONS T 112 OFFICE: AFWAL/AA	AF	\$ 49,752
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THE DEVELOPMENT OF INFRARED IMAGE INTERPRETATION METHODS REQUIRES A VERY LARGE NUMBER AND VARIETY OF IMAGES WHICH ACCURATELY REPRESENT THE RANGE OF IMAGING CONDITIONS IN WHICH THE INTERPRETATION SYSTEM WILL BE WORKING. INFRARED MODELING TECHNIQUES AND DATA BASES HAVE BEEN DEVELOPED OVER MANY YEARS AND USED AT SURFACE OPTICS AND MANY OTHER FACILITIES IN OBSERVABLES CONTROL, SIGNATURE PREDICTION, DESIGN AND EVALUATION OF COUNTERMEASURES, AND RELATED FIELDS. THESE MODELING TECHNIQUES CAN MAKE IT POSSIBLE TO PRODUCE THE REQUIRED SCOPE AND NUMBER OF INFRARED IMAGES MUCH MORE ECONOMICALLY AND QUICKLY THAN WOULD BE POSSIBLE BY DIRECT MEASUREMENTS, AND IN TURN MAKE IT FEASIBLE TO FULLY DEVELOP AND PROVE ADVANCED INFRARED IMAGE INTERPRETATION TECHNIQUES. A PHASE I PROGRAM IS PROPOSED TO DEMONSTRATE THE PRODUCTION AND USE OF IR IMAGES PRODUCED BY MODELING. THE SOFTWARE ENSEMBLE MADE IN PHASE I TO PRODUCE INFRARED IMAGES COULD BE USED WITH AN EXPANDED DATA BASE IN PHASE II TO PRODUCE LARGER AND MORE COMPLETE SETS OF IMAGES, AND FOR THE TESTING AND DEVELOPMENT OF MORE ADVANCED INTERPRETATION TECHNIQUES.

SUSQUEHANNA RESOURCES & ENVIRONMENT INC 305 MAIN ST - STE 104 JOHNSON CITY, NY 13790 TIMOTHY D MASTERS TITLE: ARTIFICIAL INTELLIGENCE APPROACHES TO SEGMENTATION AND CONTOUR EXTRACTION FOR AIR AND GROUND DEFENSE APPLICATIONS T 29 OFFICE: ARDC/SMCAR	ARMY	\$ 51,000
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TO DETECT AND IDENTIFY AIRPLANS AND GROUND TACTICAL TARGETS WITH

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>IMAGE DATA, TWO COMPLEMENTARY ANALYSES ARE REQUIRED (1) CONTOUR EXTRACTION, AND (2) SHAPE/TARGET RECOGNITION. UNTIL VERY RECENTLY, RESEARCH EMPHASIS HAS BEEN PLACED ON SHAPE RECOGNITION BASED ON SEGMENTATIONS FROM ODELS AND/OR SIMPLE SCENES. IT APPEARS THAT RESEARCH AND DEVELOPMENT EFFORTS ON SEGMENTATION WITH COMPLEX SCENES HAVE BEEN NEGLECTED. CONSEQUENTLY, THE TOTAL TARGET RECOGNITION SYSTEM SUFFERS FROM A LACK OF SOPHISTICATED CONTOUR EXTRACTION ALGORITHMS IN VIEW OF THE FACT THAT THE EFFECTIVENESS OF THE SHAPE RECOGNIZER AND TARGET CLASSIFIER IS HIGHLY DEPENDENT ON THE QUALITY OF THE INPUT DATA--THE CONTOURS. THEREFORE, THIS PROPOSED EFFORT IS INTENDED TO FILL THIS RESEARCH GAP BY PROPOSING AND TESTING A FAMILY OF AL-BASED ALGORITHMS FOR SEGMENTATION AND CONTOUR EXTRACTION. ACCORDINGLY, TWO SPECIFIC TASKS ARE PROPOSED (1) TO TEST AND FINE-TUNE THE PROPOSED ALGORITHMS USING REAL-WORLD IMAGE DATA; AND (2) TO BEGIN THE PROCESS OF A SUB-SET OF SR&amp;E'S AL-BASED ALGORITHMS IN THE C OR FORTRAN PROGRAMMING LANGUAGE AS SPECIALIZED PROCESSORS FOR AIRPLANE CONTOUR EXTRACTION AND GROUND TARGET IDENTIFICATION. THE SIGNIFICANCE OF THE EFFORT CAN BE ASSESSED FROM THE FACT THAT SUCCESSFUL SEGMENTATION WILL LEAD TO BETTER PERFORMANCE IN TARGET RECOGNITION FOR AIR AND GROUND DEFENSE APPLICATIONS.</p>		

SWINEHART S  
2921 MONTEREY SE  
ALBUQUERQUE, NM 87106  
STEVE SWINEHART

AF

\$ 49,750

## TITLE:

MINIATURIZED SOLID-STATE SHUTTERED VIDEO CAMERA

T 94

OFFICE: ASD/XR

THIS EFFORT IS DIRECTED TO THE DESIGN, DEVELOPMENT AND INITIAL TESTING OF A MINIATURIZED, SOLID-STATE, SHUTTERED VIDEO CAMERA FOR SPECIAL DEFENSE USE. ITS POTENTIAL USES IN BOTH MILITARY AND CIVILIAN SECTORS ARE FAR REACHING. SHUTTERED VIDEO TECHNOLOGY IS RELATIVELY NEW. MUCH OF THAT TECHNOLOGY HAS BEEN DEVELOPED BY THE OFFERER OF THIS PROPOSAL DURING THE PAST FEW YEARS. SHUTTERED VIDEO BRINGS TOGETHER THE BEST FEATURES OF CONVENTIONAL FILM TECHNIQUES (PHOTOGRAPHIC CAMERAS) AND VIDEO TAPE TECHNIQUES (ELECTRONIC CAMERAS) WHILE AVOIDING CERTAIN DISADVANTAGES OF BOTH. THE PRIMARY ADVANTAGES OFFERED BY EXISTING SHUTTERED VIDEO CAMERAS ARE THE CLARITY OF THE FILM-BASED CAMERAS IN SLOW OR STOP MOTION REPLAY AND THE REAL-TIME VIEWING CAPABILITY OF CONVENTIONAL VIDEO CAMERAS. SHUTTERED VIDEO

FISCAL YEAR 1986

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CAMERAS CURRENTLY IN USE ARE STILL TOO LARGE AND CUMBERSOME FOR MANY APPLICATIONS, ESPECIALLY SOME MILITARY APPLICATIONS WHERE WEIGHT, SIZE AND RUGGEDNESS ARE CRITICAL.

SYNETICS 80 MAIN ST READING, MA 01867 R A FASTRING TITLE: FIBER OPTICS BASED LOCAL AREA NETWORK T 33 OFFICE: SPAWAR	NAVY	\$ 47,622
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THIS PROPOSAL PRESENTS AN UNUSUAL AND INNOVATIVE RESPONSE TO THE SBIR SOLICITATION N86-33 REQUIRING THE CONCEPTUAL DESIGN OF A FIBER-OPTIC BASED LOCAL AREA NETWORK (LAN) FOR RADAR DISTRIBUTION. THE PROPOSAL IS TO MARRY A DRAFT NATO STANDARD DIGITIZED VIDEO FORMAT (STANAG 4217) WITH AN EVOLVING U.S. NAVY 125-Mbps FIBER-OPTIC LAN STANDARD (SAFENET II) TO PROVIDE A LOW-RISK, NATO-COMPATIBLE SOLUTION TO THE PROBLEM. THE SAFENET II STANDARD IS BASED UPON THE AMERICAN NATIONAL STANDARD INSTITUTE'S FIBER DISTRIBUTED DATA INTERFACE (ANSI/FDDI) PROTOCOL WHICH HAS BOTH SYNCHRONOUS (DIGITIZED RADAR) AND ASYNCHRONOUS (RCI CONTROL, IFF AND TRACK FILE INFORMATION) MESSAGE PROTOCOLS AND WILL SOON HAVE LSI CHIP SETS. THIS APPROACH CAPITALIZES ON THOUSANDS OF TECHNICAL MANHOURS INVESTED BY THE NATO INDUSTRIAL ADVISORY GROUP (NIAG), ANSI AND THE USN LAN COMMITTEE AND USES A SYNETICS-DEVELOPED LAN COMPUTER SIMULATION MODEL FOR PERFORMANCE EVALUATION.

SYNETICS CORP 80 MAIN ST READING, MA 01867 PAUL OLINSKI TITLE: TRAINING COST ESTIMATION DECISION SUPPORT SYSTEM T 169 OFFICE: NAVAIR/NTSC	NAVY	\$ 52,227
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THE CONCEPTUAL FRAMEWORK, MODELS AND METHODS TO DEVELOP A PROTOTYPE DECISION SUPPORT SYSTEM TO AID IN ESTIMATING TRAINING COSTS ARE PRESENTED IN THIS PROPOSAL. THE PROTOTYPE SYSTEM WOULD DEMONSTRATE THE FEASIBILITY OF THE APPROACH AND WOULD PROVIDE THE DETAILED IN-

FISCAL YEAR 1986

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SIGHT REQUIRED TO DEVELOP A FULL SCALE SYSTEM.

SYNTERIALS	SDIO	\$ 50,000
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318 VICTORY DR.

HERNDON, VA 22070

RICHARD E. ENGDAHL

TITLE:

CHARACTERIZATION OF CVD BORON NITRIDE ON TYPICAL CERAMIC  
COMPOSITES FIBERS

T 11 OFFICE:

THE COATING OF FOUR CANDIDATE CERAMIC FIBERS WITH BORON NITRIDE BY MEANS OF FOUR CANDIDATE PRECURSORS IS PROPOSED. IT HAS BEEN DETERMINED, BY PRIOR RESEARCH, THAT THE COATING OF CERAMIC FIBERS WITH BORON NITRIDE IS AN IMPORTANT FIRST STEP AS AN EFFECTIVE MEANS OF ACHIEVING NON-BRITTLE FRACTURE IN A WIDE RANGE OF CERAMIC COMPOSITES FOR USES FROM HEAT ENGINES TO ELECTROMAGNETIC APPLICATIONS. THE OBJECTIVE OF THE PROGRAM WOULD BE TO IDENTIFY THE PREFERRED PRECURSOR FOR EACH FIBER, SO THAT THE HIGHEST QUALITY COMPOSITE COULD BE READILY PRODUCED. OF PARTICULAR INTEREST WOULD BE THE STRENGTH OF THE FIBER BEFORE AND AFTER COATING, THE MORPHOLOGY OF THE BORON NITRIDE DEPOSIT, AND HOW THE SELECTED BORON NITRIDE COATINGS MIGHT VARY AS TO THEIR REACTION WITH THE MATRIX MATERIAL IN THE CONSOLIDATION STAGE.

SYNTRO CORP	ARMY	\$ 49,950
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10655 SORRENTO VALLEY RD

SAN DIEGO, CA 92121

DR RICHARD D MACDONALD

TITLE:

EXPRESSION OF MALARIA CSP ANTIGEN IN RECOMBINANT HERPESVIRUS

T 212 OFFICE: AMRDC/SGRD

MALARIA IS ONE OF THE MOST IMPORTANT PARASITIC DISEASES OF MAN. IT IS CAUSED BY SPECIES OF THE PROTOZOAN PLASMODIUM WHICH HAVE A COMPLEX LIFE CYCLE OF SEVERAL DEVELOPMENTAL STAGES THAT OCCUR IN BOTH MAN AND THE INSECT VECTOR ANOPHELINE MOSQUITO. RECENTLY, SEVERAL PLASMODIUM GENES HAVE BEEN CLONED THAT HAVE BEEN SHOWN TO CODE FOR ANTIGENS PRESENTED BY BOTH SPOROZOITES AND MEROZOITES. THESE ANTIGENS HAVE BEEN EXPRESSED IN BACTERIA AND SOME OF THEM WILL SOON BE UNDERGOING

FISCAL YEAR 1986

SUBMITTED BY

DEPT

AWARDED  
AMOUNT

CLINICAL TRIALS AS CANDIDATES FOR SUBUNIT VACCINES. SYNTRO HAS DEVELOPED THE TECHNOLOGY FOR ATTENUATING HERPESVIRUSES AND FOR USING THESE VIRUS VECTORS FOR THE EXPRESSION OF FOREIGN GENES. IN THIS PHASE I APPLICATION WE PROPOSE TO EXPRESS THE CIRCUMSPOROZOITE SURFACE ANTIGEN (CSP) OF P.FALCIPARUM IN RECOMBINANT PSEUDORABIES OF SWINE. THE ENGINEERED VIRUS WILL BE INOCULATED INTO WEANLING PIGS AND THE PRODUCTION OF ANTI-CSP ANTIBODY WILL BE ASSAYED. POSITIVE RESULTS WILL INDICATE THAT THIS APPROACH IS FEASIBLE FOR THE DEVELOPMENT OF A MALARIA VACCINE FOR HUMANS AND WILL LEAD TO A PHASE II APPLICATION TO DEVELOP A HUMAN VACCINE USING A RECOMBINANT HERPESVIRUS AS A VECTOR.

SYSTEMS ENGINEERING INC  
7833 WALKER DR - STE 308  
GREENBELT, MD 20770  
DR NABAJYOTI BARKAKATI

NAVY

\$ 50,506

TITLE:

NUMERICAL SOFTWARE FOR FILIMENTARY METAL MATRIX COMPOSITE MATERIALS  
T 144 OFFICE: NWSC

ANALYTICAL METHODOLOGY AND NUMERICAL CODE WILL BE DEVELOPED FOR THE COMPUTATION OF EFFECTIVE PARAMETER REPRESENTATIONS FOR COMPOSITE MATERIAL. WE SHALL TREAT FILIMENTARY METAL MATRIX COMPOSITE MATERIALS USING THE METHOD OF HOMOGENIZATION DEVELOPED OVER THE PAST TEN YEARS. THIS ANALYTICAL METHOD LEADS TO CONSTANT COEFFICIENT MODELS FOR THE MACROSCOPIC BEHAVIOR OF THE COMPOSITE STRUCTURE. BY ADAPTING SOME RECENT RESEARCH RESULTS OF BEGIS, ET AL., WE CAN COMPUTE THE MICROSCOPIC STRESS DISTRIBUTIONS IN THE MATERIAL. THESE LOCAL STRESS FORCES ARE IMPORTANT BECAUSE THEY CAN INITIATE CRACKS AND DELAMINATIONS. OVERSTRESSES AT THE MICROSCOPIC LEVEL MAY PRODUCE FIBER RUPTURES IN FILIMENTARY MATERIALS. THE SOFTWARE WILL CONSIST OF NUMERICAL REDUCTION ROUTINES FOR THE HOMOGENIZATION METHOD, ASSOCIATED FINITE ELEMENT SOFTWARE, AND COMMAND LANGUAGE AND INTERFACE STRUCTURE DESIGNED TO PERMIT EASY INTERACTION WITH THE SYSTEM AND TO FACILITATE DATA ENTRY.

SYSTEMS ENGR INC (AUTOMATION RSCH INC)  
3939 BRIARCREST CT  
LAS VEGAS, NV 89120  
DR GEORG F MAUER

ARMY

\$ 49,978

TITLE:

LOW COST NON-INTRUSIVE TORQUE TRANSDUCER DEVELOPMENT  
T 119 OFFICE: TACOM/AMSTA

THE LOW COST NON-INTRUSTIVE TORQUE TRANSDUCER IS ADDED TO AN EXISTING

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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DRIVE TRAIN. IT MEASURES DIRECTLY THE ENGINE OUTPUT TORQUE WITH SHORT RESPONSE TIME. THE ANGULAR DEFLECTION AT BOTH ENDS OF THE CRANKSHAFT IS DETECTED BY TWO NON-CONTACTING ENCODER-PICKUP COMBINATIONS. THE PHASE ANGLE BETWEEN THE PULSE TRAINS FROM THE ENCODERS IS PROPORTIONAL TO THE SHAFT DEFLECTION AND THEREFORE A MEASURE OF THE ENGINE OUTPUT TORQUE. A LOW-COST DIGITAL CIRCUIT SAMPLES AND PROCESSES THE RAW TORQUE DATA. THIS DIGITAL CONCEPT PROVIDES FOR STABLE TRANSDUCER OPERATION INDEPENDENT OF MOTOR SPEED AND VARYING AMBIENT TEMPERATURES. THE TRANSDUCER IS RUGGED AND INSENSITIVE TO VARIATIONS OF TEMPERATURE, HUMIDITY, CONDENSATION, OIL OR DIRT CONTAMINATION. THE STARTER MOTOR TEETH ON THE FLYWHEEL PROVIDE ONE ENCODER, THE SECOND ENCODER IS MOUNTED ON THE FANBELT DRIVE WHEEL. THE TRANSDUCER OUTPUT SIGNAL CAN BE CONFIGURED TO BE EITHER AN ANALOG DC VOLTAGE OR A MICROPROCESSOR COMPATIBLE DIGITAL DATA WORD.

SYSTEMS TECHNOLOGY INC  
13766 S HAWTHORNE BLVD  
HAWTHORNE, CA 90250  
THOMAS T MYERS

AF

\$ 49,998

## TITLE:

FLYING QUALITIES REQUIREMENTS FOR NONLINEAR FLIGHT MANEUVERS  
T 130 OFFICE: AFWAL/FI

ADVANCED HIGHLY MANEUVERABLE, HIGHLY AUGMENTED AIRCRAFT OPERATING AT THE EXTREMES OF THEIR FLIGHT ENVELOPES CAN EXHIBIT COMPLEX, INTERACTING KINEMATIC, INERTIAL, AERODYNAMIC, AND FLIGHT CONTROL NONLINEARITIES WHICH PRESENT SIGNIFICANT PROBLEMS FOR THE AIRCRAFT DESIGNER. THE PILOT IS ALSO FACED WITH SPECIAL DIFFICULTIES IN EXTREME, LARGE AMPLITUDE MANEUVERING ESPECIALLY IN COMBAT SITUATIONS WHERE CONCENTRATION ON TACTICS AND SITUATIONAL AWARENESS IS CRITICAL. IN THIS HIGH WORKLOAD SITUATION THE PILOT MUST OFTEN DEAL WITH LOSS OF VISUAL REFERENCES, CUE CONFLICTS, UNCERTAINTY OF CONTROL POWER MARGINS, RAPIDLY CHANGING "G" LOADS, BIODYNAMIC INTERFERENCE, AND OTHER PROBLEMS. THE OVERALL GOAL OF THE PROPOSED WORK IS TO DEVELOP DESIGN GUIDES, CRITERIA, AND ANALYSIS METHODS WHICH WILL ALLOW DESIGNERS TO DEAL WITH THESE PROBLEMS AND CREATE THE BEST POSSIBLE FLYING QUALITIES FOR ADVANCED HIGHLY MANEUVERABLE AIRCRAFT. THE WORK PROPOSED HERE WILL CATALOG AND CLASSIFY GENERIC MANEUVER SPECIFICATIONS. PILOT-CENTERED AND VEHICLE-CENTERED CONSIDERATIONS AND REQUIREMENTS WILL BE DEVELOPED TO AID IN IMPROVING THE PILOT'S SITUATION IN PRE-COGNITIVE, PURSUIT, AND PROPRIOCEPTIVE MANUAL CONTROL MODES. BE-

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CAUSE OF THE COMPLEX, MULTIFACETED CHARACTER OF THE PROBLEM, PHASE I WORK WILL EMPHASIZE DETAILED PROBLEM DEFINITION AND IDENTIFICATION OF HIGH POTENTIAL WORK FOR PHASE II.

SYSTOLIC SYSTEMS INC 1065 E BROKAW RD SAN JOSE, CA 95131 RICHARD H TRAVASSOS TITLE: KALMAN FILTER APPLICATION OF DISTRIBUTED COMPUTATION T 22 OFFICE: DARPA	DARPA	\$ 58,704
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TARGET TRACKING AND NAVIGATION EQUIPMENT SUCH AS THE GPS CONTAIN A KALMAN FILTER WHICH EITHER ACTS TO SMOOTH DATA WHEN THE UNIT IS UN-AIDED, OR AS AN ESTIMATING FILTER WHEN INERTIAL DATA ARE ACCEPTED. THE NEED TO INTEGRATE MULTIPLE SENSORS RESULTS IN A HYBRID SYSTEM WITH EXTREMELY LARGE COMPUTATIONAL REQUIREMENTS FOR REAL-TIME APPLICATIONS. OFTEN THE HYBRID SYSTEM TAKES THE FORM OF A "CASCADED" FILTER TO EASE THE COMPUTATIONAL BURDEN. SENSOR DATA INTEGRATION IS OFTEN DIFFICULT DUE TO CORRELATING THE TIME OF THE MEASUREMENTS AND THE DIFFERENT MEASUREMENT RATES OF THE SENSORS. IN THIS PROPOSAL, PARALLEL KALMAN FILTER ARCHITECTURES ARE OPTIMIZED FOR HYBRID SYSTEMS CONSISTING OF MULTIPLE SENSORS TO ACHIEVE IMPROVED PERFORMANCE AND STABILITY. THE COMPUTATIONAL ADVANTAGE OF PARALLEL PROCESSING MINIMIZES MEASUREMENT TIME SENSITIVITY AND DATA TRANSFER OVER THE BUS IN THE SYSTOLIC ARCHITECTURES PROPOSED. THE PARTITIONED SQUARE ROOT AND UPPER DIAGONAL KALMAN FILTER ALGORITHMS PROPOSED ARE CAPABLE OF MULTI-RATE FILTERING VIA A UNIQUE DECOUPLING OF THE PREDICTOR AND CORRECTOR EQUATIONS IN THE FILTER WHILE MAINTAINING OPTIMAL ESTIMATION. THE PARALLELED PROCESSING TECHNIQUES PROPOSED CAN BE EXTENDED TO THE MORE GENERAL CASE OF DISTRIBUTED FILTERING FOR REAL-TIME NAVIGATION, TARGET TRACKING AND SCENE ANALYSIS.

SYSTOLIC SYSTEMS INC 1065 E BROKAW RD SAN JOSE, CA 95131 RICHARD H TRAVASSOS TITLE: AUTOMATED ROBOT LOADING SYSTEM T 29 OFFICE: AD	AF	\$ 56,207
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THE LOADING OF MUNITIONS, PARTICULARLY DURING BATTLE, IS A MAJOR

FISCAL YEAR 1986

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APPLICATION OF ROBOTICS. THE LOADING PROCESS, ALTHOUGH SEEMINGLY SIMPLE, IS MOST DIFFICULT UNDER ATTACK FOR A HUMAN OPERATOR IN THE PRESENCE OF PHYSICAL DISTURBANCES SUCH AS CHEMICAL/BIOLOGICAL WARFARE, RAIN, HEAVY WIND AND LACK OF LIGHT. SUBSEQUENTLY, FATIGUE IS COMMON AND BATTLE EFFECTIVENESS VARIES WIDELY AND IS EXTREMELY OPERATOR DEPENDENT. TO ENHANCE PRODUCTIVITY AND IMPROVE REPEATABILITY, ROBOT LOADING SYSTEMS NEED TO BE DEVELOPED. THE UNUSUAL ENVIRONMENT ASSOCIATED WITH MILITARY APPLICATIONS NECESSITATES THE USE OF "INTELLIGENT" ROBOT LOADING SYSTEMS EMPLOYING EXPERT SYSTEM AND ADAPTIVE CONTROL TECHNOLOGY. ON-LINE ADAPTIVE CONTROL TECHNIQUES FOR PRECISE PLACEMENT NEED TO BE DEVELOPED TO ADDRESS THIS PROBLEM. THE LARGE REAL-TIME COMPUTATIONAL REQUIREMENTS OF ADAPTIVE TECHNIQUES, NECESSITATES THE USE OF PARALLEL PROCESSING - PARTICULARLY WHEN CONSIDERING NONLINEAR ROBOT DYNAMICS. A HIGH-SPEED NUMERIC SYSTEM AND KNOWLEDGE BASE TO SET AND CONTINUOUSLY ADJUST LOADING PARAMETERS BASED ON SENSOR FEEDBACK IS PROPOSED. THE DEVELOPMENT OF PRACTICAL MODELS AND CONTROL OF THE ROBOT LOADER, STOCHASTIC ENVIRONMENT, THE ADAPTIVE CONTROL SYSTEM AND THE GENERATION OF THE KNOWLEDGE BASE ARE THE FOCUS OF THIS PROPOSAL.

SYSTOLIC SYSTEMS INC 1065 E BROKAW RD SAN JOSE, CA 95131 RICHARD H TRAVASSOS TITLE: PARALLEL KALMAN FILTER PREDICTION ALGORITHMS AND ARCHITECTURES	ARMY	\$ 58,465
T 19	OFFICE: ARDC/SMCAR	

TARGET TRACKING AND NAVIGATION EQUIPMENT SUCH AS THE GPS CONTAIN A KALMAN FILTER WHICH EITHER ACTS TO SMOOTH DATA WHEN THE UNIT IS UNAIDED, OR AS AN ESTIMATING FILTER WHEN INERTIAL DATA ARE ACCEPTED. THE NEED TO INTEGRATE MULTIPLE SENSORS RESULTS IN A HYBRID SYSTEM WITH EXTREMELY LARGE COMPUTATIONAL REQUIREMENTS FOR REAL-TIME APPLICATIONS. OFTEN THE HYBRID SYSTEM TAKES THE FORM OF A "CASCADED" FILTER TO EASE THE COMPUTATIONAL BURDEN. SENSOR DATA INTEGRATION IS OFTEN DIFFICULT DUE TO CORRELATING THE TIME OF THE MEASUREMENTS AND THE DIFFERENT MEASUREMENT RATES OF THE SENSORS. IN THIS PROPOSAL, PARALLEL KALMAN FILTER ARCHITECTURES ARE OPTIMIZED FOR HYBRID SYSTEMS CONSISTING OF MULTIPLE SENSORS TO ACHIEVE IMPROVED PERFORMANCE AND STABILITY. THE COMPUTATIONAL ADVANTAGE OF PARALLEL PROCESSING MINIMIZES MEASUREMENT TIME SENSITIVITY AND DATA TRANSFER OVER THE BUS IN



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THE SYSTOLIC ARCHITECTURES PROPOSED. THE PARTITIONED SQUARE ROOT AND UPPER DIAGONAL KALMAN FILTER ALGORITHMS PROPOSED ARE CAPABLE OF MULTI-RATE FILTERING VIA A UNIQUE DECOUPLING OF THE PREDICTOR AND CORRECTOR EQUATIONS IN THE FILTER WHILE MAINTAINING OPTIMAL ESTIMATION. THE PARALLEL PROCESSING TECHNIQUES PROPOSED CAN BE EXTENDED TO THE MORE GENERAL CASE OF DISTRIBUTED FILTERING FOR REAL-TIME NAVIGATION, TARGET TRACKING AND SCENE ANALYSIS.

SYSTOLIC SYSTEMS, INC.

SDIO

\$ 58,705

1065 E. BROKAW RD.

SAN JOSE, CA 95131

RICHARD H. TRAVASSOS

TITLE:

KALMAN FILTER ARCHITECTURE FOR BATTLE MANAGEMENT

T 9 OFFICE:

TARGET TRACKING AND NAVIGATION EQUIPMENT SUCH AS THE GPS CONTAIN A KALMAN FILTER WHICH EITHER ACTS TO SMOOTH DATA WHEN THE UNIT IS UNAIDED, OR AS AN ESTIMATING FILTER WHEN INERTIAL DATA ARE ACCEPTED. THE NEED TO INTEGRATE MULTIPLE SENSORS RESULTS IN A HYBRID SYSTEM WITH EXTREMELY LARGE COMPUTATIONAL REQUIREMENTS FOR REAL-TIME APPLICATIONS. OFTEN THE HYBRID SYSTEM TAKES THE FORM OF A "CASCADED" FILTER TO EASE THE COMPUTATIONAL BURDEN. SENSOR DATA INTEGRATION IS OFTEN DIFFICULT DUE TO CORRELATING THE TIME OF THE MEASUREMENTS AND THE DIFFERENT MEASUREMENT RATES OF THE SENSORS. IN THIS PROPOSAL, PARALLEL KALMAN FILTER ARCHITECTURES ARE OPTIMIZED FOR HYBRID SYSTEMS CONSISTING OF MULTIPLE SENSORS TO ACHIEVE IMPROVED PERFORMANCE AND STABILITY. THE COMPUTATIONAL ADVANTAGE OF PARALLEL PROCESSING MINIMIZES MEASUREMENT TIME SENSITIVITY AND DATA TRANSFER OVER THE BUS IN THE SYSTOLIC ARCHITECTURES PROPOSED. THE PARTITIONED SQUARE ROOT AND UPPER DIAGONAL KALMAN FILTER ALGORITHMS PROPOSED ARE CAPABLE OF MULTI-RATE FILTERING VIA A UNIQUE DECOUPLING OF THE PREDICTOR AND CORRECTOR EQUATIONS IN THE FILTER WHILE MAINTAINING OPTIMAL ESTIMATION. THE PARALLEL PROCESSING TECHNIQUES PROPOSED CAN BE EXTENDED TO THE MORE GENERAL CASE OF DISTRIBUTED FILTERING FOR REAL-TIME NAVIGATION, TARGET TRACKING AND SCENE ANALYSIS.

SYSTRAN CORP

DARPA

\$ 49,976

4126 LINDEN AVE

DAYTON, OH 45432

DR BARRY DEER

TITLE:

MACHINE LEARNING USING AN ADAPTIVE-NETWORK FOR PATTERN RECOGNITION

T 7 OFFICE: DARPA

THE EVOLUTION OF ADAPTIVE NETWORK TECHNOLOGY HAS PROCEEDED TO A POINT

FISCAL YEAR 1986

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DEPT

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AMOUNT

WHERE THEIR UTILIZATION IN SOLVING APPLICATIONS PROBLEMS IS TERMED "ARTIFICIAL INTELLIGENCE". HOWEVER A KEY REMAINING PROBLEM REQUIRES FOCUSING ON ALGORITHM DEVELOPMENT WHICH CAN LEARN DURING ACTUAL OPERATION AND THROUGH EXPERIENCE. IN THIS SBIR WE PROPOSE RESEARCH TO ENHANCE A PROTOTYPE ADAPTIVE-NETWORK PATTERN RECOGNITION SYSTEM DESIGNED BY SYSTRAN UNDER AN AIR FORCE SUPPORTED RESEARCH PROGRAM. ADAPTIVE NETWORKS ARE AN ALTERNATIVE APPROACH TO AI WHICH MODEL BIOLOGICAL LEARNING SYSTEMS AND HAVE BEEN DEMONSTRATED TO LEARN FROM EXPERIENCE WITHOUT ADDITIONAL PROGRAMMING. THE TASKS SET FORTH IN THE STATEMENT OF WORK WILL ADVANCE A PATTERN RECOGNIZING ADAPTIVE NETWORK FOR FAST-REAL TIME PROCESSING.

SYSTRAN CORP

AF

\$ 49,936

4126 LINDEN AVE

DAYTON, OH 45432

SRIVATHSAN VENKATARAMAN

TITLE:

ELEVATED TEMPERATURE CRACK GROWTH STUDIES OF ADVAN TITANIUM  
ALUMINIDE

T 158

OFFICE: AFWAL/ML

ORDERED INTERMETALLIC TITANIUM ALUMINIDE  $Ti(3)Al$  ALLOYED WITH NIOBIUM POSSESSES ATTRACTIVE HIGH TEMPERATURE PROPERTIES AND MODERATE LOW TEMPERATURE DUCTILITY, BUT APPLICATION IS LIMITED TO STATIC COMPONENTS IN AIRCRAFT GAS TURBINE ENGINES. TO EXTEND THEIR USE TO ROTATING PARTS OF TURBINE ENGINES, BETTER UNDERSTANDING OF LIFE LIMITING PROCESSES SUCH AS CREEP/FATIGUE CRACK GROWTH AND FRACTURE IS REQUIRED. PHASE I RESEARCH INVOLVES INVESTIGATION OF FATIGUE CRACK GROWTH IN  $Ti(3)Al$  PLUS NIOBIUM, INCLUDING STUDY OF ENVIRONMENTAL EFFECTS ON CRACK BEHAVIOR. MECHANICAL TESTING WILL BE CONDUCTED USING A MINICOMPACT TENSION TYPE SPECIMEN UNDER LABORATORY AIR AND VACUUM ENVIRONMENTS, WITH TEMPERATURES RANGING FROM ROOM TEMPERATURE TO 649 DEG C (1200 DEG F). TWO HEAT TREATMENT PROCEDURES ARE SELECTED TO PROVIDE DIFFERENT BASELINE MICROSTRUCTURE. CONSTANT LOAD AMPLITUDE FATIGUE CRACK GROWTH TESTS WILL BE CONDUCTED IN A SERVO-HYDRAULIC MTS TESTING MACHINE UNDER COMPUTER CONTROL. DETAILED FRACTOGRAPHIC ANALYSIS OF ALL FRACTURE SPECIMENS USING A SCANNING ELECTRON MICROSCOPE IS ALSO PLANNED. RELATIONSHIPS BETWEEN THE MICROSTRUCTURE AND FRACTURE MORPHOLOGY WILL BE EVALUATED. A COMPARISON BETWEEN THE AIR AND VACUUM CRACK GROWTH DATA WILL BE MADE TO UNDERSTAND ENVIRONMENTAL INFLUENCE. RESULTS OF PHASE I PRELIMINARY DATA

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SUBMITTED BY

DEPT

AWARDED  
AMOUNT

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WILL BE USED TO SELECT AN OPTIMUM ALLOY DESIGN AND DERIVE A WORK PLAN  
FOR PHASE II RESEARCH.

SYSTRAN CORP  
4126 LINDEN AVE  
DAYTON, OH 45432  
RICHARD E FELDMANN

AF

\$ 49,527

TITLE:

EXPERT SYSTEM FOR PILOT DECISION AIDING

T 116

OFFICE: AFWAL/AA

THIS PROJECT INVESTIGATES USE OF AN EXPERT SYSTEM MANAGER TO CO-ORDINATE DATA AND DECISION INFORMATION AMONG MULTIPLE EXPERT SYSTEMS ON AN AIRCRAFT TO ENSURE THAT THEIR COMBINED RESPONSES ADDRESS THE CRITICAL NEEDS OF THE PILOT; THAT IS, SYSTEM RESPONSES ARE RECEIVED IN A TIMELY MANNER, AND MAKE SENSE IN THE CURRENT SITUATION. PHASE I PROVIDES DESIGNS FOR FOUR EXPERT SYSTEMS. THREE OF THESE SYSTEMS COVER RESPECTIVELY, AIRCRAFT ROUTE PLANNING, THREAT REACTION, AND EMERGENCY PROCEDURES. THE FOURTH SYSTEM IS THE EXPERT SYSTEM MANAGER, WHICH WILL MONITOR OPERATION OF THE APPLICATIONS EXPERT SYSTEMS, DISTRIBUTE HARDWARE AND SOFTWARE RESOURCES TO THESE SYSTEMS, AND CHECK THE REASONABLENESS OF THE RESULTS FROM THESE SYSTEMS. PHASE II WILL DEMONSTRATE THE EFFECTIVENESS OF THESE EXPERT SYSTEMS AS AN AUTOMATION TOOL FOR AIDING THE PILOT. THE DEMONSTRATION WILL BE ACCOMPLISHED AT THE AVIONICS SYSTEM ANALYSIS AND INTEGRATION LABORATORY (AVSAIL), A FACILITY OF THE AFWAL AVIONICS LABORATORY, WRIGHT-PATTERSON AFB, OHIO.

SYSTRAN CORP  
4126 LINDEN AVE  
DAYTON, OH 45432  
DR BARRY DEER

AF

\$ 0

TITLE:

MACHINE LEARNING USING AN ADAPTIVE-NETWORK FOR PATTERN RECOGNITION

T 94

OFFICE: ASD/XR

THE EVOLUTION OF HIGH ORDER LANGUAGES FOR ROBOTIC SYSTEMS HAS PROCEEDED TO A POINT WHERE THEIR UTILIZATION IN SOLVING APPLICATIONS PROBLEMS IS TERMED "ARTIFICIAL INTELLIGENCE". HOWEVER A KEY REMAINING TECHNOLOGY PROBLEM FOCUSES ON TECHNIQUES WHICH WILL ALLOW SOFT-

FISCAL YEAR 1986

SUBMITTED BY

DEPT

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AMOUNT

WARE SYSTEMS TO LEARN AS A FUNCTION OF THEIR UTILIZATION, AND EXPERIENCE. IN THIS SBIR WE PROPOSE RESEARCH TO ENHANCE A PROTOTYPE ADAPTIVE-NETWORK PATTERN RECOGNITION SYSTEM DESIGNED BY SYSTRAN UNDER AN AIR FORCE SUPPORTED RESEARCH PROGRAM. ADAPTIVE NETWORKS ARE AN ALTERNATIVE APPROACH TO AI WHICH MODEL BIOLOGICAL LEARNING SYSTEMS AND HAVE BEEN DEMONSTRATED TO LEARN FROM EXPERIENCE WITHOUT ADDITIONAL PROGRAMMING. THE TASKS SET FORTH IN THE STATEMENT OF WORK WILL ADVANCE A PATTERN RECOGNIZING ADAPTIVE NETWORK FOR FAST REAL-TIME PROCESSING.

SYSTRAN CORP  
4126 LINDEN AVE  
DAYTON, OH 45432  
DR BARRY C DEER

AF

\$ 49,994

## TITLE:

NEW THEORY OF MACHINE INTELLIGENCE: FIRST STEP THE REPRESENTATION  
FORMAT

T 94

OFFICE: ASD/XR

IN THIS PROPOSAL WE DESCRIBE A NEW APPROACH TO MACHINE INTELLIGENCE WHOSE LONG TERM GOAL IS TO ACHIEVE GENERAL PURPOSE MACHINE INTELLIGENCE THROUGH A HIERARCHICAL DEVELOPMENT OF COGNITIVE PROCESSES. THERE WILL BE 10 STAGES TO ATTAINING THIS GOAL. THE FOCUS OF THE PROPOSAL IS THE FIRST STAGE, NAMELY, THE DEVELOPMENT OF A DISTRIBUTED FORMAT FOR THE SYSTEM'S INTERNAL REPRESENTATION OF EXPERIENCE. THE APPROACH IS UNIQUE IN THAT THE FOCUS OF RESEARCH IS ON THE SYSTEM'S ADAPTIVE MECHANISMS WHICH CAUSE THE SYSTEM TO DEVELOP THE COGNITIVE PROCESSES DIRECTLY IN THE ARCHITECTURE IN RESPONSE TO REAL WORLD EXPERIENCES. IN THIS APPROACH THE INTELLIGENT FUNCTIONS ARE DEVELOPED CONCOMITANTLY WITH THE SYSTEM ARCHITECTURE ON WHICH THEY WILL RUN. THE GOAL OF THIS RESEARCH CAN BE CHARACTERIZED AS LEADING TO THE DEVELOPMENT OF MACHINES THAT ARE NOT PROGRAMMED, BUT TRAINED.

TACAN AEROSPACE CORP  
2111 PALOMAR AIRPORT RD - STE 100  
CARLSBAD, CA 92008  
MICHAEL M SALOUR

AF

\$ 50,000

## TITLE:

INTEGRATED FIBER OPTIC THEORY INTO INTEGRATED CIRCUIT TECHNOLOGY

T 40

OFFICE: ESD/XRCT

WE PROPOSE TO INVESTIGATE OPTICAL SIGNAL PROCESSING TECHNOLOGY

FISCAL YEAR 1986

SUBMITTED BY	DEPT	AWARDED AMOUNT
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INVOLVING ELECTRO-OPTIC DEVICES THAT COMBINE FIBER-OPTICS, MICROWAVE THEORY, AND INTEGRATED CIRCUIT TECHNOLOGY. OUR PROPOSED IDEAS ARE BASED ON THE PULSE-POWER AND REPETITION RATES THAT ARE CURRENTLY AVAILABLE FROM A MODE-LOCKED SEMICONDUCTOR DIODE LASER, WHICH WE HAVE DEVELOPED OVER THE PAST FEW YEARS. SUCH OPTICAL LOGIC DEVICES ARE BASED ON PICOSECOND COUPLING OF HIGH-SPEED SIGNALS TO AND FROM THE GaAs CHIP AND REQUIRE SOLUTION OF THE RELATED PROBLEMS OF PARASITICS, LOADING, AND AN UNAMBIGUOUS DETERMINATION OF THE GATE DELAY. NUMEROUS VARIATIONS OF THESE TECHNIQUES WILL BE IMPLEMENTED TO DEVELOP MICROWAVE THEORY FOR THE REDUCED SIZE USED BY CURRENT FIBER OPTIC WAVE GUIDES AND IC CIRCUITS. THE POTENTIAL FOR SUCH CONCEPTS FOR NOVEL DESIGNS OF ULTRA HIGH SPEED OPTICAL SWITCHING, SIGNAL PROCESSING AND LOGIC OPERATION IN COMPACT DEVICES WILL BE EXPLORED.

TACAN AEROSPACE CORP	NAVY	\$ 50,000
2111 PALOMAR AIRPORT RD - STE 100		
CARLSBAD, CA 92008		
MICHAEL M SALOUR		
TITLE:		
MOLECULAR STRUCTURES FOR AVIONICS AND AVIATION MATERIALS		
T 82	OFFICE: NAVAIR	

ADVANCED AVIONICS AND AVIATION MATERIALS WILL UTILIZE LIGHT WEIGHT STRUCTURES CAPABLE OF MAINTAINING SUPERIOR ELECTRICAL, MECHANICAL AND THERMAL PROPERTIES IN HOSTILE OPERATIONAL ENVIRONMENTS. RAPID DEVELOPMENTS IN STATE-OF-THE-ART CONDUCTIVE POLYMERS HAVE CREATED UNIQUE OPPORTUNITIES TO THE FURTHER MINIATURIZATION OF SILICON CHIP ELECTRONICS TECHNOLOGY UTILIZING SYNTHETIC OR BIOLOGICAL POLYMERS ON THE SCALE OF INDIVIDUAL MOLECULES. WE PROPOSE TO EXPLORE A VARIETY OF NOVEL TECHNIQUES AND CONCEPTS INVOLVING MOLECULAR ELECTRONICS AND THEIR APPLICATION TO AVIONICS, COMPUTERS, SENSORS, AND OPTO-ELECTRONIC DEVICES. OUR STUDIES WILL EXPLORE DESIGN CONCEPTS, A VARIETY OF COMPUTER MODELINGS OF MOLECULAR ELECTRONIC CIRCUITS, AND THE CONNECTOR PROBLEM--HOW TO LINK A WIRE FROM A KEYBOARD, FOR EXAMPLE, TO AN INDIVIDUAL MOLECULE. THE ULTIMATE GOAL IS TO COMBINE THE ADVANCES WE PROPOSE TO MAKE INTO A FULL-FLEDGED TECHNOLOGY TO OVERCOME THE TOUGH PROBLEMS THAT ARE CURRENTLY FACING MOLECULAR ELECTRONIC RESEARCH. OUR PROPOSED STUDIES SHOULD ALSO YIELD INFORMATION CONCERNING HOW MOLECULAR-SCALE OPTO-ELECTRONIC DEVICES MIGHT WORK, AND PROVIDE DIRECT CLUES ABOUT OTHER TYPES OF ELEMENTS THAT ARE QUITE DIFFERENT AND MUCH BETTER IN PERFORMANCE THAN THE ONES

FISCAL YEAR 1986

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ORIGINALLY PROPOSED.

TACAN AEROSPACE CORP  
2111 PALOMAR AIRPORT RD - STE 100  
CARLSBAD, CA 92008  
MICHAEL M SALOUR

NAVY

\$ 50,000

TITLE:

REMOTE EM SENSOR TECHNOLOGY

T 48 OFFICE: NAVSEA

WE PROPOSE TO INVESTIGATE A SENSITIVE ELECTROMAGNETIC FIELD SENSOR WHOSE OUTPUT IS COUPLED VIA AN OPTICAL FIBER TO REMOTE PROCESSING ELECTRONICS. THIS DEVICE SHOULD PROVIDE A CONVENIENT AND VERY SENSITIVE METHOD OF DETECTING PULSED ELECTROMAGNETIC FIELDS. IT ALSO WILL BE INEXPENSIVE AND CAN BE QUITE SMALL IN SIZE AND EASILY DISPLAYED FOR A SUBMARINE PLATFORM. THE NAVY HAS A SPECIFIC REQUIREMENT FOR REMOTE SENSING OF ELECTROMAGNETIC FIELDS FROM VERY LOW FREQUENCIES TO THE VISIBLE SPECTRUM. WE PROPOSE A SIMPLE SENSOR OF ELECTROMAGNETIC FIELDS OF INTERMEDIATE FREQUENCIES SAY, FROM 100 KHz TO 100 MHz, OR FOR VERY RAPID CHANGES OF THE MAGNETIC FIELD. AS DESCRIBED BELOW, THE SENSOR ITSELF IS INEXPENSIVE, NEEDS ONLY BATTERIES FOR OPERATION AND CAN BE CONNECTED WITH OPTICAL FIBERS TO A REMOTELY LOCATED SIGNAL PROCESSOR. EVEN IN ITS SIMPLEST FORM, THE SENSOR HAS SOME DIRECTIONAL PROPERTIES, AND THE EXTENSION OF THE PRINCIPLE TO SENSOR ARRAYS IS OBVIOUS. SINCE THE OPERATION IS BASED ON AMPLITUDE MODULATION OF SIGNAL THERE IS NO REQUIREMENT FOR SINGLE MODE POLARIZATION CONSERVING FIBERS.

TAU CORP  
485 ALBERTO WY - BLDG D  
LOS GATOS, CA 95030  
G JEFFREY GEIER

ARMY

\$ 49,943

TITLE:

AN INTEGRATED NAVIGATION SYSTEM FOR ROBOTIC VEHICLE ENHANCEMENT

T 113 OFFICE: TACOM/AMSTA

THIS PROPOSAL IS FOR THE DESIGN OF AN INTEGRATED NAVIGATION SYSTEM FOR A ROBOTIC VEHICLE. INCLUDED IN THE PROPOSED EFFORT IS THE FORMULATION OF CANDIDATE NAVIGATION SYSTEMS INCORPORATING ANY ONE OF SEVERAL "DEAD RECKONING" SYSTEMS (ODOMETER OR INERTIAL INSTRUMENT-

FISCAL YEAR 1986

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BASED) AND POSITION FIXES DERIVED FROM GPS AND LANDMARK RECOGNITION USING STEREOSCOPIC VISION. A KALMAN FILTER SHALL BE DESIGNED TO OPTIMALLY BLEND THE NAVIGATION SENSOR DATA. THE PERFORMANCE OF THE CANDIDATE NAVIGATION SYSTEMS SHALL BE EXAMINED USING A TAU SIMULATION FACILITY UPGRADED TO INCLUDE ROBOTIC VEHICLE TYPE TRAJECTORY GENERATION AND MODELS FOR THE ROBOTIC VEHICLE-UNIQUE NAVIGATION SENSORS. THIS UPGRADED SIMULATION SHALL BE DELIVERED TO THE U.S. ARMY TANK-AUTOMOTIVE COMMAND TO FACILITATE UNDERSTANDING OF THE TECHNICAL ISSUES AND TO ENABLE INDEPENDENT EXAMINATION OF CANDIDATE NAVIGATION SYSTEM PERFORMANCE. BASED ON THE SIMULATED PERFORMANCE OF THE CANDIDATE SYSTEMS AND THEIR EXPECTED COST AND COMPLEXITY, AN INTEGRATED SYSTEM SHALL BE RECOMMENDED AND DESCRIBED IN DETAIL IN THE FINAL TECHNICAL REPORT. A PRELIMINARY DESIGN FOR THE NAVIGATION SOFTWARE SHALL ALSO BE PROVIDED, INCLUDING EQUATION-LEVEL ALGORITHM DOCUMENTATION, A RECOMMENDED PROCESSOR ARCHITECTURE, EXPECTED PROCESSING RATES, AND HARDWARE INTERFACE DESCRIPTIONS.

TAYLOR & DIVOKY INC  
9086 CYPRESS GREEN DR  
JACKSONVILLE, FL 32216  
DAVID DIVOKY

DNA \$ 48,158

TITLE:

LARGE WAVES IN CHANNELS

T 1 OFFICE: AM/SBIR

IMPULSIVE SOURCES (LANDSLIDES, EXPLOSIONS, AND SO FORTH) ARE CAPABLE PRODUCING EXTREMELY LARGE WAVES IN SUFFICIENTLY DEEP WATER. IF CONTAINED IN A STEEP-WALLED FORD-LIKE CHANNEL, SUCH WAVES CAN BE PROPAGATED WITH LITTLE LOSS OF ENERGY OVER SIGNIFICANT DISTANCES. THE MAJOR ENERGY DISSIPATOR IN THIS CASE MIGHT BE THE OCCURRENCE OF BREAKING IN THE NARROW SHALLOW ZONES ALONG EACH BANK; THIS LOSS MECHANISM CAN THEN BE VIEWED AS A DAMAGE MECHANISM PRECISELY DIRECTED TO SHORELINE FACILITIES. SUCH A WAVE OCCURRED IN THE FAMOUS CASE OF LITUYA BAY, ALASKA IN 1958. A LANDSLIDE WITH ENERGY COMPARABLE TO A 100KT WEAPON GENERATED AN EXTREME WAVE SYSTEM WHICH CAUSED DEVASTATING EFFECTS. RUNUP AS HIGH AS 1700 FEET DENUDED LARGE FORESTS; FORESTS ALONG THE BANKS OF THE CHANNEL-LIKE BAY WERE STRIPPED OF TREES TO ELEVATIONS OF 200 FEET. SIMILAR EFFECTS COULD BE EXPECTED IN WATERWAYS OF MILITARY AND CIVIL IMPORTANCE AT MANY LOCATIONS WORLD-WIDE, CAUSED EITHER BY LANDSLIDE OR SUBMERGED EXPLOSION. WORK CONDUCTED DURING THE PAST TWO DECADES IN THE AREAS OF EXPLOSION WAVE

FISCAL YEAR 1986

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AMOUNT

EFFECTS, LANDSLIDES, AND EDGE WAVES PERMIT THE SIGNIFICANCE OF SUCH CHANNELIZED WAVES AND THE STATE OF RELEVANT KNOWLEDGE TO BE ASSESSED.

TAYLOR DEVICES INC  
90 TAYLOR DR  
NORTH TONAWANDA, NY 14120  
DOUGLAS P TAYLOR

AF

\$ 47,044

## TITLE:

ICBM DEEP BASING SHOCK ISOLATION SYSTEM DEFINITION FOR MISSILE  
TRANSPORTER/LAUNCHER STORAGE

T 240 OFFICE: BMO/MYSC

PREVIOUS STUDIES OF NUCLEAR WEAPONS EFFECTS ON ICBM LAUNCH SYSTEMS HAVE BEEN LARGELY CONFINED TO CONSIDERATIONS OF SURFACE OR CONVENTIONAL SILO BASING. THE DEEP BASE CONCEPT DISTINCTLY ALTERS THE SHOCK PULSE INPUT TO THE LAUNCHER FROM THAT EXPECTED ON CONVENTIONAL SYSTEMS, ALLOWING ENTIRELY NEW AND UNIQUE CONCEPTS OF SHOCK ISOLATION TO BE INTRODUCED. THE EFFORT DESCRIBED WITHIN THIS PROPOSAL CONSISTS OF UTILIZING AN EXISTING MULTIPURPOSE COMPUTER MODEL TO STUDY THE EFFECT OF SHOCK PULSES ON A RIGID BODY MASS MODEL OF THE MISSILE TRANSPORTER/LAUNCHER. THE COMPUTER PROGRAM HAS THE ABILITY TO SUBJECT THE MODEL TO THE PULSE FIELDS TYPICAL OF NUCLEAR WEAPONS, AS WELL AS TO STUDY ISOLATION CONCEPTS UTILIZING ESSENTIALLY NON-LINEAR SPRING AND DAMPING ELEMENTS. THE COMPUTER MODEL HAS BEEN SUCCESSFULLY USED TO STUDY THE EFFECTS OF CONVENTIONAL WEAPONS EFFECTS ON SURFACE AND SEABASED WEAPON SYSTEMS, WITH PERFORMANCE VERIFIED BY FULL SCALE TESTING. THE ANALYSIS WILL YIELD AN ISOLATION SYSTEM CONCEPT ALLOWING MAXIMUM PULSE ATTENUATION WITH MINIMUM RATTLESPEACE AND ENVELOPE, PLUS PRESENT PARAMETRIC DESIGN DATA ON ISOLATOR CONCEPTS. A DESIGN AND TEST PROGRAM IS DESCRIBED TO ALLOW CONCEPT VERIFICATION AT LOW COST.

TAYLOR S R & ASSOCS  
423 NE FENWAY  
BARTLESVILLE, OK 74006  
DR SCOTT R TAYLOR

AF

\$ 45,267

## TITLE:

ULTRASONICALLY ENHANCED PAINT REMOVAL

T 153 OFFICE: AFWAL/ML

IN REMOVING PAINT FROM FIBER COMPOSITE COMPONENTS, TRADITIONAL PRO-



FISCAL YEAR 1986

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CEDURES SUCH AS PLASTIC BEAD BLASTING HAVE BEEN SHOWN TO LEAD TO REMOVAL OF THE GEL COAT, EXTENSIVE FIBER BREAKAGE AND MATRIX DEBONDING WHICH RESULTS IN LOSSES OF UP TO 30% IN THE MATRIX-DOMINATED MECHANICAL PROPERTIES AND MINOR LOSSES IN THE FIBER-DOMINATED PROPERTIES. VERY RECENT PRELIMINARY RESULTS ACHIEVED BY US INDICATE THAT THE USE OF ULTRASONIC PAINT FRACTURE HAS THE POTENTIAL TO REMOVE PAINT FROM COMPOSITES WITHOUT LOSS OF STRUCTURAL INTEGRITY. THE OBJECTIVE OF THE PROPOSED PROJECT IS TO AUGMENT PRELIMINARY RESULTS IN ORDER TO DEMONSTRATE THE TECHNICAL FEASIBILITY OF DEVELOPMENT OF A HAND-HELD ULTRASONIC TOOL FOR USE IN REMOVING PAINT FROM RESIN-BASED FIBER COMPOSITES WITHOUT ALTERATION OF THE BASIC MECHANICAL AND/OR STRUCTURAL PROPERTIES OF THE COMPOSITE. PHASE I EFFORT IS DIRECTED AT QUANTIFICATION OF THE PHENOMENA AND DESIGN REQUIREMENTS WHILE PHASE II DEVELOPMENT WILL FOCUS ON OPTIMIZATION OF THE TECHNIQUE IN THE ACTUAL WORKING ENVIRONMENT.

TAYLOR S R & ASSOCS 423 NE FENWAY BARTLESVILLE, OK 74006 DR SCOTT R TAYLOR TITLE: THERMOPLASTIC COMPOSITE PROCESSING VIA ULTRASONICS T 162 OFFICE: AFWAL/ML	AF	\$ 42,243
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AIRCRAFT COMPONENTS WHICH UTILIZE THERMOPLASTIC COMPOSITES OFFER SIGNIFICANT ADVANTAGES OVER METALLIC STRUCTURES DUE TO THE COMBINATION OF REDUCED WEIGHT AND INCREASED STRENGTH INHERENT IN COMPOSITE STRUCTURES. FABRICATION OF THERMOPLASTIC COMPOSITES IS PLAGUED BY POROSITY OR VOIDS IN THE CONSOLIDATED PART, POOR, INEFFICIENT FIBER WETTING AND DIFFICULT CONTROL OF RESIN FLOW AND CRYSTALLINITY. ULTRASONIC ACTIVATION CAN IMPROVE OR INCREASE RESIN FLOW AT SIGNIFICANTLY LOWER TEMPERATURES AND PRESSURES OVER CURRENT TECHNOLOGY. THE OBJECTIVE OF THE PROPOSED PROJECT IS TO DEMONSTRATE THE TECHNICAL FEASIBILITY OF APPLYING SUCH BENEFICIAL EFFECTS TO IMPROVE THE PROCESSING OF THERMOPLASTIC RESINS SUCH AS PEEK. PHASE I WORK WILL QUANTIFY THE EFFECT OF ULTRASONIC ACTIVATION ON RESIN VISCOSITY, FIBER WETTING AND RESIN CRYSTALLINITY WHILE PHASE II DEVELOPMENT WILL SCALE UP THE TECHNIQUE TO CONTINUOUS PRODUCTION ENVIRONMENTS.

TECH REPS INC 5000 MARBLE AVE NE - STE 222 ALBUQUERQUE, NM 87110 NOEL H ETHRIDGE TITLE: INERTIAL TRACKING SYSTEM TO MEASURE BLAST INDUCED DISPLACEMENTS T 143 OFFICE: LABCOM/BRL	ARMY	\$ 50,000
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THE ULTIMATE OBJECTIVE IS THE DEVELOPMENT OF AN INERTIAL TRACKING

FISCAL YEAR 1986

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SYSTEM TO MEASURE THE DISPLACEMENT OF TARGETS DURING BLAST TESTS IN LARGE SHOCK TUBES OR HIGH EXPLOSIVE SIMULATIONS OF NUCLEAR WEAPONS. THE SYSTEM IS INTENDED TO SUPPLEMENT PHOTOGRAPHIC COVERAGE OF TARGET MOVEMENT WHEN THE TARGET IS OBSCURED BY DUST OR BY A CONDENSATION CLOUD. THE SYSTEM WILL UTILIZE ACCELEROMETERS AND ROLL OR ROLL RATE SENSORS AND ON BOARD RECORDING TO PROVIDE A SELF-CONTAINED UNIT FOR MOUNTING IN A TARGET. THE SYSTEM IS TO BE INTEGRATED FROM OFF-THE-SHLEF HARDWARE. IN PHASE I THE FEASIBILITY OF THE SYSTEM FOR THE PURPOSE INTENDED WILL BE DETERMINED BY CONSTRUCTING A SENSOR ARRAY AND PLACING IT ON BOARD A LABORATORY TARGET. THE TARGET WILL BE MOVED ON KNOWN PATHS AND THE OUTPUT OF THE SENSORS REORDED USING OFF-BOARD RECORDING EQUIPMENT. THE RECORDS WILL BE PROCESSED AND THE TRAJECTORY OF THE CENTER OF GRAVITY OF THE TARGET AND ITS ANGULAR ORIENTATION AS INDICATED BY THE SENSORS WILL BE COMPARED TO THE ACTUAL MOVEMENT. THE CAPABILITIES OF SUCH A SENSOR ARRAY TO MEET THE SYSTEM OBJECTIVE WILL BE EVALUATED. IN PHASE II THE COMPLETE SYSTEM WILL BE ASSEMBLED.

TECH REPS INC  
5000 MRBLE AVE NE - STE 222  
ALBUQUERQUE, NM 87110  
NOEL H ETHRIDGE  
TITLE:

DNA

\$ 48,346

VANE FLOW DIRECTION SENSOR FOR BLAST WAVES  
T 3 OFFICE: AM/SBIR

THE ULTIMATE OBJECTIVE IS THE DEVELOPMENT OF A VANE-TYPE FLOW DIRECTION SENSOR TO MEASURE THE RAPID CHANGES THAT OCCUR IN A PRE-CURSED BLAST WAVE. SUCH A SENSOR WILL CONSIST OF A SMALL CYLINDRICAL PROBE WITH MOVABLE VANES PROJECTING FROM IT. THE WAVES WILL BE PLACED AS NEAR THE END OF THE PROBE TOWARD THE EXPLOSION AS POSSIBLE TO MINIMIZE THE DISTRUBANCE OF FLOW AT THE VANES BY THE PROBE. THE PROBE WILL BE MADE AS SMALL AS POSSIBLE WITH THE INTENT THAT IT BE USABLE IN AND OVER A HELIUM LAYER AS SMALL AS TWO INCHES THICK. THE VANES WILL BE MADE OF STRONG, ABRASION RESISTANT MATERIAL. IN THIS PHASE I STUDY THE MINIMUM REQUIREMENTS THAT MUST BE MET FOR PRE-CURSED BLAST WAVE STUDIES WILL BE ESTABLISHED, AND THE VANE AND PROBE DESIGNED AND THE MEANS FOR SENSING THE ANGLE OF ROTATION OF THE VANES DETERMINED. IN PHASE II THE COMPLETE SENSOR SYSTEM WILL BE BUILT AND TESTED.

FISCAL YEAR 1986

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TECH REPS INC 5000 MARBLE AVE NE - STE 222 ALBUQUERQUE, NM 87110 RALPH E REISLER TITLE: HIGH ENERGY EXPLOSIVE SOURCE FOR NUCLEAR WEAPONS SIMULATION T 2 OFFICE: AM/SBIR	DNA	\$ 49,994

A HIGH ENERGY, HIGH QUALITY EXPLOSIVE SOURCE FOR APPLICATION TO MEDIUM CHARGE WEIGHT EFFECTS SIMULATION WILL BE DEVELOPED. THE THIOKOL TPH 3342 EXPLOSIVE MATERIAL CONTAINING 85% HMX WHICH HAS BEEN TESTED SUCCESSFULLY ON AN 8 AND 1000 LB SCALE CANNOT BE MIXED IN QUANTITIES GREATER THAN 4000 LB. IN ORDER TO EXTEND THIS EXPLOSIVE TO LARGER CHARGE WEIGHT, CASTING IN SEGMENTS AND BONDING THE SEGMENTS TOGETHER WITHOUT ENTRAINING AIR IS TO BE STUDIED. THREE 8 LB SEGMENTED SPHERICAL CHARGES ARE TO BE PRODUCED EMPLOYING THE MOST DESIRABLE METHODS AND MATERIALS.

TECHNICAL RESEARCH ASSOC., INC. 410 CHIPETA WAY, SUITE 222 SALT LAKE CITY, UT 84108 JOSEPH K. WEEKS TITLE: METALLOPHILIC OXIDE COLLOIDS IN REFRACTORY METAL ALLOYS T 11 OFFICE:	SDIO	\$ 55,409
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IN THIS STUDY A HIGH TEMPERATURE NIOBIUM ALLOY WILL BE PRODUCED IN WHICH THE OXIDE USED FOR DISPERSION STRENGTHENING IS METALLOPHILIC, I.C., WETTED BY MOLTEN METAL. THE ALLOY WILL BE PREPARED BY ATOMIZING A MIXTURE OF MOLYBDENUM - THORIA, NIOBIUM AND WETTING METAL POWDERS.

TECHNICAL RESEARCH ASSOCS 410 CHIPETA WY - STE 222 SALT LAKE CITY, UT 84108 GAIL BOWERS-IRONS TITLE: THE BIOEXTRACTION OF GALLIUM/GERMANIUM ORE T 171 OFFICE: AFWAL/ML	AF	\$ 49,007
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WITH THE ADVENT OF HIGH-GRADE SOURCE DEPLETION, ENVIRONMENTAL

FISCAL YEAR 1986

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<p>POLLUTION COSTS AND FOREIGN COMPETITION, BIOHYDROMETALLURGY IS BE- COMING BOTH APPLICATION AND COST EFFECTIVE. THE MARKET STRENGTH OF GALLIUM AND GERMANIUM IS INCREASING WHILE DOMESTIC ORES DECREASE. TRA BELIEVE THAT THROUGH BIOLEACHING PROCESSES, US STOCKPILES CAN BE INCREASED AT MINIMUM COST AND MAXIMUM EFFICIENCY.</p>		

TECHNICAL RESEARCH ASSOCS 410 CHIPETA WY - STE 222 SALT LAKE CITY, UT 84108 DR STEPHEN PETERSON TITLE: ELECTRONICALLY STEERABLE AGILE BEAM ANTENNA T 113 OFFICE: TACOM/AMSTA	ARMY	\$ 54,998
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TRA PROPOSES THE DEVELOPMENT OF A LOW COST, ELECTRONICALLY STEERABLE AGILE BEAM ANTENNA. PHASE I DEVELOPMENT WILL EXAMINE THE FEASIBILITY OF THE DEVICE CONFIGURED AS FOUR QUARTER WAVE-LENGTH VERTICAL ELEMENTS (OVER A GROUND PLANE), A PIN DIODE SWITCHING AND PHASING ASSEMBLY, A DEDICATED CONTROL MICROCOMPUTER, AND AN INTERFACED TRANSCEIVER OPERATING WITH A DIGITAL COMMUNICATIONS SYSTEM. THE BEAM WILL INITIALLY SCAN IN FOUR SECTORS BUT WILL IN PHASE II BE EXTENDED TO ADDITIONAL SECTORS DEPENDING ON THE SPECIFIC ANTENNA SYSTEM EMPLOYED. SUCH AN ANTENNA SYSTEM WILL ENHANCE THE QUALITY AND SECURITY OF MILITARY COMMUNICATIONS BY INCREASING THE SIGNAL STRENGTH IN THE DESIRED DIRECTION AND MINIMIZING IT IN ALL OTHERS. THE DEVICE WILL BE USEFUL FOR SMALL MISSION, MOBILE, ROBOTIC, LARGE MOVING PLATFORM AND BASE STATION (FIXED) COMMUNICATION SYSTEMS.

TECHNICAL RESEARCH ASSOCS 410 CHIPETA WY SALT LAKE CITY, UT 84108 S C PETERSON TITLE: RAPID MINIATURE HEMATOCRIT DETERMINATION DEVICE T 214 OFFICE: AMRDC/SGRD	ARMY	\$ 54,990
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DURING PHASE II DEVELOPMENTAL WORK ON A CONTINUOUS FLOW ULTRASONIC PLASMA/BLOOD CELL SEPARATOR TRA FOUND THAT IT WAS ABLE TO BAND AND MOVE BLOOD CELLS (THUS SEPARATING THEM FROM PLASMA) IN MICRO-HEMATOCRIT TUBES. THIS CAPABILITY ALLOWS THE DEVELOPMENT OF A DE-

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>VICE WHICH WILL RAPIDLY, IN A MATTER OF SECONDS DETERMINE HEMATOCRIT FROM BLOOD CONTAINED IN A HEMATOCRIT TUBE AS WELL AS ALLOW THE COLLECTION OF CELL FREE PLASMA TO BE SUBSEQUENTLY USED FOR ANALYSIS OF VARIOUS PLASMA PARAMETERS. THIS CAPABILITY WILL GREATLY ASSIST FIELD MEDICAL PERSONNEL IN THE DELIVERY OF EMERGENCY MEDICAL CARE BY PROVIDING CARDIO-VASCULAR SYSTEM INFORMATION. THIS PHASE I STUDY WILL DEMONSTRATE THE FEASIBILITY OF THE DEVICE AND PROVIDE THE FRAMEWORK AND DATA NECESSARY FOR PHASE II DEVELOPMENT. THE END PRODUCT WILL BE A TOTALLY PORTABLE HEMATOCRIT MEASUREMENT APPARATUS ABOUT THE SIZE OF A HAND HELD DIGITAL MULTIMETER. AN ALTERNATE VERSION OF THE DEVICE WILL PROVIDE IN ADDITION CELL FREE PLASMA.</p>		

TECHNICAL RESEARCH ASSOCS 410 CHIPETA WY SALT LAKE CITY, UT 84108 CHARLES D BAKER TITLE: RAPID ANASTOMOSIS OF SMALL VESSELS T 214 OFFICE: AMRDC/SGRD	ARMY	\$ 54,870
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A NEW TECHNIQUE TO JOIN THE SMALL (0.05-2 mm DIAMETER) VEIN AND ARTERIES USING A DISSOLVABLE STENT AND PROPRIETARY SEMI-AUTOMATIC WRAPPING DEVICE THAT SETS AND COMPLETES A COJOINING IN LESS THAN 1 MINUTE. NO STAPLES ARE USED AND NO VESSEL EVERSION IS REQUIRED. PHASE I OF THE SBIR PROGRAM WILL TEST THE CONCEPT IN SMALL ANIMALS AND CONDUCT TESTS TO OPTIMIZE THE WRAPPING DEVICE. THE NEW TECHNIQUES IS EXPECTED TO: 1) SIGNIFICANTLY REDUCE TIME AND EFFORT REQUIRED TO JOIN VESSELS WITH PRESENT SUTURE METHODS, 2) PROVIDE COJOINING THAT HAS IMPROVED RELIABILITY AND PATENCY, 3) ENHANCE HEALING OF VESSELS BY REDUCING PHYSICAL HANDLING, AND 4) EXPAND THE SCOPE OF MICROSURGERY THROUGH THE USE OF NEW TECHNIQUES. PHASE II OF THIS PROGRAM WILL FOCUS ON PROVING THE LONG-TERM PATENCY OF THIS NEW TECHNIQUE IN ANIMAL AND CLINICAL EXPERIMENTS. THE TOOLS WILL BE OPTIMIZED FOR EFFICIENCY AND RELIABILITY AND THE MATERIALS WILL BE EVALUATED TO OBTAIN MAXIMUM TISSUE COMPATIBILITY.

TECHNICAL SOLUTIONS INC PO BOX 1148 MESILLA PARK, NM 88047 DR ALTON L GILBERT TITLE: NEXT GENERATION VIDEO TRACKER TECHNOLOGY T 170 OFFICE: TECOM/WSMR	ARMY	\$ 49,300
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VIDEO TRACKING HAS EVOLVED OVER THE PAST FIFTEEN YEARS FROM SIMPLE

FISCAL YEAR 1986

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CONTRAST TRACKERS TO MORE COMPLEX AND "INTELLIGENT" TRACKING SYSTEMS BASED UPON SCENE INTERPRETATION AND OBJECT IDENTIFICATION METHODS. RESEARCH IN THE PAST DECADE IN AUTOMATIC TARGET RECOGNITION AND REAL-TIME TRACKING METHODS HAS PRODUCED A NEW GENERATION OF ALGORITHMS APPROPRIATE TO THE TRACKING REQUIREMENT. WHILE SOME OF THE ALGORITHMS ARE PROPRIETARY AND THE CLOSELY GUARDED SECRETS OF COMPANIES RESPONSIBLE FOR THEIR DEVELOPMENT, A VERY LARGE PERCENTAGE ARE IN THE PUBLIC DOMAIN. THESE ALGORITHMS ARE THE TOOLS BY WHICH THE TRACKING FUNCTION CAN BE PERFORMED. WSMR IS A NATIONAL LEADER IN TRACKING TECHNOLOGY, BUT THE ALGORITHMS EMPLOYED IN THE REAL-TIME VIDEO TRACKER ARE OVER TEN YEARS OLD, AND MANY IMPROVED "IMAGE INTERPRETATION" ALGORITHMS EXIST THAT WILL FURTHER EXTEND THE RTV CLASS OF TRACKING SYSTEM. TSI WILL PERFORM RESEARCH UNDER THIS CONTRACT TO SURVEY EXISTING TRACKER ARCHITECTURES, DEVELOP A CONCEPTUAL DESIGN OF A MODERN TRACKER ARCHITECTURE, SYNTHESIZER TRACKER ALGORITHM REQUIREMENTS, AND IDENTIFY AND EVALUATE EXISTING ALGORITHMS AND EMERGING RESEARCH RESULTS AGAINST THESE CRITERIA. A REPORT WILL BE PREPARED THAT SUMMARIZES ALL OF THE RELEVANT INFORMATION, IN TECHNICAL REPORT FORMAT, SUITABLE FOR DISTRIBUTION INTERNAL TO THE GOVERNMENT. SINCE MUCH OF THE TARGET RECOGNITION WORK IS BASED UPON WEAPONS SYSTEMS APPLICATIONS, A PORTION OF THE FINAL REPORT WILL PROBABLY BE CLASSIFIED.

TECHNOLOGY DEVELOPMENT ASSOCS INC  
992 OLD EAGLE SCHOOL RD - STE 910  
WAYNE, PA 19087  
N J DISPENZIERS

DNA

\$ 60,650

## TITLE:

ABOVEGROUND-UNDERGROUND TESTING/THREAT SIMULATION INVESTIGATION

T 2 OFFICE: AM/SBIR

AS ABOVEGROUND TEST (AGT) SIMULATORS ARE DEVELOPED AND ENHANCED, UNDERGROUND TEST (UGT) DATA IS IN MOST INSTANCES USED AS THE YARDSTICK TO WHICH THE SIMULATOR CAPABILITY TO REPLICATE NUCLEAR WEAPONS EFFECTS IS MEASURED. RATHER THAN REPLICATE NUCLEAR WEAPONS EFFECTS SUCH AS MATERIAL SPALLATION, SURFACE VAPORIZATION, ETC. THE SIMULATOR SHOULD BE CAPABLE OF PRODUCING THREAT ENVIRONMENT SIMULATIONS. THIS IS, UGT DATA USED TO SUPPORT SIMULATOR DEVELOPMENT MUST IN SOMEWAY BE ASSOCIATED WITH A THREAT ENVIRONMENT. THE OBJECTIVE OF THIS PHASE I INVESTIGATION IS TO CLOSE THE LOOP BY ASSESSING WHICH UGT'S BEST SIMULATE CURRENT THREAT ENVIRONMENTS. IN ADDITION, MATERIALS

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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AND STRUCTURAL CONFIGURATIONS TESTED THEREIN SHALL BE IDENTIFIED WITH REGARD TO TEST LEVELS, TEST RESULTS, AND SYSTEM APPLICATION. THE RESULTS OF THIS PHASE I PROGRAM ARE INTENDED TO ENHANCE THE DEVELOPMENT OF NUCLEAR WEAPONS EFFECTS SIMULATION TECHNIQUES IN THAT BOTH THREAT ENVIRONMENT AND CORRESPONDING TEST RESULTS WILL BE IDENTIFIED.

TECHNOLOGY DEVELOPMENT ASSOCS INC 992 OLD EAGLE SCHOOL RD - STE 910 WAYNE, PA 19087 NICHOLAS J DISPENZIERS TITLE: RV COMPOSITE MATERIAL/PAYLOAD NH&S INTERACTION INVESTIGATION T 5 OFFICE: AM/SBIR	DNA	\$ 66,400
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THE NEED TO REDUCE WEIGHT IN REENTRY VEHICLE (RV) DESIGNS HAS BECOME A CRITICAL ISSUE WITHIN THE RV DESIGN COMMUNITY. AS SUCH, RV DESIGNERS ARE LOOKING TO THE USE OF HIGH STRENGTH TO WEIGHT RATIO MATERIALS SUCH AS THAT OFFERED BY GRAPHITE EPOXY AS A REPLACEMENT FOR THOSE STRUCTURAL MATERIALS CURRENTLY IN PLACE. THIS PHASE I PROGRAM SHALL INVESTIGATE THE IMPACT OF TYPICAL RV NUCLEAR HARDNESS REQUIREMENTS ON THE MATERIAL AND STRUCTURAL RESPONSE PERFORMANCE OF THESE CANDIDATE COMPOSITE MATERIALS.

TECHNOLOGY FOR ENERGY CORP ONE ENERGY CTR - LEXINGTON DR KNOXVILLE, TN 37922 DR ROBERT W HENDRICKS TITLE: AN ON-LINE X-RAY DIFFRACTION METHOD FOR DETERMINING GRAIN SIZE IN POLYCRYSTALLINE MATERIALS T 132 OFFICE: LABCOM/MTL	ARMY	\$ 56,729
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A NONDESTRUCTIVE TECHNIQUE IS PROPOSED FOR THE ON-LINE DETERMINATION OF GRAIN SIZE IN POLYCRYSTALLINE MATERIALS. THE METHOD CORRELATES FLUCTUATIONS IN INTENSITY OF X-RAYS DIFFRACTED FROM VARIOUS CRYSTALLOGRAPHIC PLANES IN THE MATERIAL TO THE GRAIN SIZE. THROUGH THE USE OF POSITION-SENSITIVE X-RAY DETECTORS AND HIGH-SPEED DIGITAL COMPUTERS AND DATA ACQUISITION SYSTEMS, IT IS POSSIBLE TO GATHER AND INTERPRET SUFFICIENT DATA ENABLING THE TECHNIQUE TO BE USED ON-LINE FOR MATERIAL PROCESSING. THE METHOD CAN BE USED ON BOTH STATIONARY

FISCAL YEAR 1986

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SAMPLES AND MOVING MATERIALS (ELG., ROLLED SHEET). THE PROCEDURE IS APPLICABLE IN A WIDE RANGE OF POLYCRYSTALLINE MATERIALS, INCLUDING METALS, ALLOYS, CERAMICS, AND SINTERED MATERIALS IN A VARIETY OF SHAPES.

TECHNOLOGY FOR ENERGY CORP ONE ENERGY CTR - LEXINGTON DR KNOXVILLE, TN 37922 DR JAMES C ROBINSON TITLE: DUAL LEVEL HIGH COOLANT TEMPERATURE WARNING SWITCH T 116 OFFICE: TACOM/AMSTA	ARMY	\$ 50,606
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A DUAL LEVEL TEMPERATURE WARNING SWITCH IS TO BE DESIGNED, PROTOTYPED, AND VERIFIED TO MEET TECHNICAL SPECIFICATIONS. THE PROTOTYPE DUAL LEVEL TEMPERATURE WARNING SWITCH WILL BE DESIGNED IN MINIATURE, MAKING IT INTERCHANGEABLE WITH THE CURRENT SINGLE LEVEL TEMPERATURE WARNING SWITCH SPECIFIED IN MIL-S-12285/2C, 22 JULY 1975. THE PHASE I RESULTS WILL ESTABLISH THE VIABILITY OF THE DESIGN. THE MANUFACTURABILITY AND ULTIMATE RELIABILITY WILL BE ESTABLISHED IN PHASE.

TECHNOLOGY RESEARCH GP PO BOX 6531 WESTLAKE VILLAGE, CA 91359 DR A ARORA TITLE: PHOTOELECTRON EMISSION TECHNIQUES FOR PREBOND INSPECTION OF MATERIALS T 154 OFFICE: AFWAL/ML	AF	\$ 49,950
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PHOTOELECTRON EMISSION (PE) TECHNIQUES ALONG WITH A FEW OTHER NDE TECHNIQUES INCLUDING, ULTRASONICS (UT), ARE CONSIDERED FOR PREBOND INSPECTION OF MATERIALS IN MANUFACTURING AS WELL AS FIELD ENVIRONMENT. A PLAN IS PROPOSED TO DEMONSTRATE THE FEASIBILITY OF USING PE FOR PREBOND INSPECTION OF MATERIALS WHICH INCLUDES CORRELATION OF PE PARAMETERS WITH BOND QUALITY PARAMETERS. SUCH A RELATIONSHIP IS ALSO PLANNED FOR TESTING OTHER VARIOUS NDE TECHNIQUES AND THEIR POTENTIAL IN CONTROLLING, PREDICTING, OR ASSURING BOND QUALITY. A COMPARISON OF PE RESULTS WITH THAT OF OTHER NDE TECHNIQUES IS PLANNED. A LIMITED AMOUNT OF THERMAL ACOUSTIC WAVE IMAGING AND PHOTOACOUSTIC



FISCAL YEAR 1986

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IMAGING IS PROPOSED FOR REVIEW PURPOSES. IT IS ANTICIPATED THAT THE LITERATURE REVIEW AND THE RESULTS OF THIS STUDY WILL PROVIDE A DATA BASE AND A STRONG FOUNDATION FOR DEVELOPING A PORTABLE, SIMPLE NDE TECHNIQUE THAT COULD BE USED FOR DEPOT OR FIELD INSPECTION OF PREPARED SURFACES OF 100% QUALIFICATION PRIOR TO BONDING. THE NAVY, GENERAL DYNAMICS, BOEING AND HUGHES AIRCRAFT WILL PROVIDE COOPERATION IN SAMPLE PREPARATION BASED ON STANDARD SURFACE PREPARATION SPECIFICATIONS AND IN GATHERING UNPUBLISHED DATA ON PREBOND INSPECTION METHODS.

TECHNOLUBE PRODUCTS 5814 E 61ST STREET LOS ANGELES, CA 90040 ROBERT E PRATT TITLE: PERSISTENT CHEMICAL WARFARE UPTAKE SIMULANTS - DEVELOPMENT T 274 OFFICE: AMD/RDO	AF	\$ 47,848
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THE OBJECTIVE OF THIS PROPOSED PROGRAM IS TO PROVIDE PERFLUORINATED CANDIDATE FLUID MATERIALS AS PERSISTANT CHEMICAL WARFARE UPTAKE SIMULANTS. BASED ON PREVIOUS EXPERIENCE WITH CHLOROPENTAFLUOROBENZENE (CPFB), WHICH IS A LEADING CANDIDATE FOR NON-PERSISTANT UPTAKE SIMULANTS, IT IS SUGGESTED THAT HIGHER MOLELCULAR WEIGHT DERIVATIVES OF CPFB SHOULD PROVIDE CANDIDATE FLUIDS WHILE STILL RETAINING THE REQUIRED PROPERTIES, E.G., GOOD DETECTABILITY BY ELECTRON CAPTURE DETECTION USING GAS CHROMATOGRAPHIC ANALYSIS, BIOLOGICAL INERTNESS, AND AN ADJUSTABLE (BY MOLECULAR DESIGN) VAPOR PRESSURE. THESE MATERIALS SHOULD ALSO POSSESS PROPERTIES OF ENHANCING ABSORPTION BY INHALATION OR THROUGH THE SKIN SURFACE. TWO CLASSES OF COMPOUNDS ARE SUGGESTED. THE FIRST CLASS CONSISTES OF PROPERLY SUBSTITUTED CHLOROPENTAFLUOROBENZENE COMPOUNDS,  $RC(6)F(4)Cl$ . THE SUBSTITUENT R MUST BE PROPERLY CHOSEN SO AS TO DECREASE THE VAPOR PRESSURE SUFFICIENTLY TO PROVIDE A BOILING POINT RANGE OF 200 DEG C TO 300 DEG C AND CONSIST OF THE FOLLOWING: Cl (o AND m), Br (o AND m),  $C(6)F(5)O$ ,  $ClC(6)F(4)$ ,  $C(n)F(2n)Cl$ ,  $C(n)F(2n+1)$ , AND  $CF(2)=CFCl$ . THE SECOND CLASS OF COMPOUNDS WILL BE THE MONO OR POLYCHLORO-FLUOROALKANES.

TECHNOLUBE PRODUCTS 5814 E 61ST ST LOS ANGELES, CA 90040 ROBERT E PRATT TITLE: SYNTHETIC LIQUID SPACE LUBRICANTS T 167 OFFICE: AFWAL/ML	AF	\$ 49,894
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THE OBJECTIVE OF THE PROPOSED INVESTIGATION IS THE PRODUCTION AND

FISCAL YEAR 1986

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CHARACTERIZATION OF LIQUID SPACE LUBRICANTS OF HIGH VISCOSITY INDEX, A KINEMATIC VISCOSITY OF 90-150 CS AT 40 DEG C, GOOD COMPATIBILITY WITH BEARING MATERIALS, AND A VAPOR PRESSURE OF  $<10^{-9}$  MM HG AT 20 DEG C, E.G., A BOILING POINT OF  $>225$  DEG C UNDER A PRESSURE OF 1 MM HG. A FURTHER OBJECTIVE IS TO INVESTIGATE THE THERMAL STABILITY AND THE ANTIWEAR CHARACTERISTICS OF ALL COMPOUNDS PRODUCED, E.G., DETERMINING THE VISCOSITY AND VAPOR PRESSURE OF THE MATERIALS AFTER EXPOSURE TO ELEVATE TEMPERATURE. THE THREE COMPOUND CLASSES PROPOSED FOR INVESTIGATION ARE SILAHYDROCARBONS, HYDROGENATED POLYALPHAOLEFINS, AND, TO A LESSER EXTENT, ALKYL BENZENES. ALL OF THESE COMPOSITIONS ARE KNOWN TO POSSESS GOOD LUBRICANT PROPERTIES, RELATIVELY HIGH VISCOSITY INDICES, AND ACCEPTABLE THERMAL STABILITY; YET NONE HAS BEEN PRODUCED THUS FAR THAT WILL MEET THE SPECIFIED LOW VOLATILITY/VAPOR PRESSURE CHARACTERISTICS. THE PROPOSED APPROACH WILL THEREFORE BE TO REPRODUCE STRUCTURAL ARRANGEMENTS SIMILAR TO THOSE ALREADY KNOWN, BUT OF MOLECULAR WEIGHTS HIGH ENOUGH TO DECREASE THE VAPOR PRESSURE TO OR BELOW THE DESIRED RANGE WITH SUFFICIENT STRUCTURAL AND COMPOSITIONAL VARIETY TO ENSURE THE NEEDED LIQUID CHARACTER.

TEKMAT CORP. 200 HOMER AVE. ASHLAND, MA 01721 IH HOUNG LOH TITLE: SURFACE FLUORINATED COMPOSITE MATERIALS FOR USE IN SPACE	SDIO	\$ 49,517
T 11	OFFICE:	

ADVANCED POLYMER COMPOSITE MATERIALS HAVE BECOME LEADING CANDIDATES FOR CONSTRUCTION OF FUTURE SPACE STATION STRUCTURES. HOWEVER, THESE POLYMER MATERIALS ARE SUSCEPTIBLE TO DEGRADATION IN SPACE ENVIRONMENT. FLUOROPOLYMERS ARE KNOWN TO BE RESISTANT TO THIS DEGRADATION, BUT CAN NOT BE READILY PROCESSED INTO COMPOSITE SUITABLE FOR SPACE APPLICATION. IT IS PROPOSED THAT FURTHER RESEARCH BE DONE ON A METHOD OF COMBINING THE EROSION RESISTANCE OF FLUOROPOLYMERS WITH THE DESIRABLE MECHANICAL PROPERTIES OF CONVENTIONAL COMPOSITE MATERIALS. THIS CAN BE DONE BY CHEMICALLY MODIFYING THE EXISTING MOLECULES IN THE OUTERMOST SURFACE LAYER OF THE MATERIALS TO PRODUCE A TEFLON-LIKE SUBSTANCE. THIS MODIFIED SURFACE SHOULD SIGNIFICANTLY REDUCE DEGRADATION OF THE MATERIAL IN A SPACE ENVIRONMENT, BUT LEAVE THE MECHANICAL INTEGRITY OF THE ORIGINAL MATERIAL INTACT.

FISCAL YEAR 1986

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TEKNICON 115 EARLE ST CLEMSON, SC 29633 EDWARD W PAGE TITLE: EXPERT SYSTEMS FOR MANUFACTURING T 150 OFFICE: NWSC	NAVY	\$ 48,668

THE GOAL OF THIS RESEARCH IS TO DETERMINE THE TECHNICAL FEASIBILITY OF PROVIDING EXPERT SYSTEMS ACCESS TO EXTERNAL DATA BASES AND REAL-TIME SENSORY INFORMATION NEEDED IN A MANUFACTURING ENVIRONMENT. MOST CURRENT EXPERT SYSTEMS INTERACT WITH PEOPLE WHO PROVIDE ANSWERS TO QUESTIONS POSED BY THE SYSTEM. FOR MANY APPLICATIONS, A USER-FRIENDLY INTERFACE SUPPORTING TEXTUAL INPUT/OUTPUT IS ADEQUATE; HOWEVER, EVEN THE MOST RUDIMENTARY APPLICATION OF EXPERT SYSTEMS TO MANUFACTURING WILL REQUIRE MORE THAN SIMPLE TEXTUAL INPUT/OUTPUT CAPABILITY. EXPERT SYSTEMS IN MANUFACTURING ENVIRONMENTS MUST BE CAPABLE OF ACCEPTING REAL-TIME SENSORY INPUTS FROM VARIOUS PROCESS VARIABLES AND USING THESE DATA AS INPUTS TO THE INFERENCE PROCESS. MOREOVER, SUCH SYSTEMS WILL LIKELY REQUIRE ACCESS TO REMOTE DATABASES CONTAINING FACTUAL INFORMATION SUCH AS INVENTORY DATA, PRODUCTION NEEDS, AND MAINTENANCE SCHEDULES. SUCH FUNCTIONS ARE OUTSIDE THE SCOPE OF TYPICAL COMMERCIAL EXPERT SYSTEM SHELLS, ESPECIALLY THOSE DESIGNED FOR EXECUTION ON PERSONAL COMPUTERS.

TELECOMMUNICATION SCIENCE ASSOC., INC. 2560 1ST AVE., SUITE 105 SAN DIEGO, CA 92103 RICHARD MIDDLESTEAD TITLE: REAL TIME STRESSED CHANNEL SIMULATOR T 10 OFFICE:	SDIO	\$ 79,740
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THE STRATEGIC DEFENSE INITIATIVE (SDI) RESEARCH EFFORTS ARE DIRECTED AT A NUMBER OF SYSTEM ARCHITECTURE OPTIONS INVOLVING SPACE, AIRBORNE AND TERRESTRIAL PLATFORMS. A MAJOR CONSIDERATION IN THE SYSTEM ARCHITECTURE IS THE RESOLUTION OF THE BATTLE MANAGEMENT CONCEPT. TO RESOLVE THE MANY COMPLICATED ISSUES THE SPACE DEFENSE INITIATIVE ORGANIZATION (SDIO) HAS RECOGNIZED THE NEED FOR A REAL-TIME TEST FACIL-

FISCAL YEAR 1986

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ITY. A COMMON REQUIREMENT IN ALL OF THE ARCHITECTURES IS THE NEED FOR COMMUNICATION, COMMAND, AND CONTROL DATA LINKS BETWEEN THE VARIOUS PLATFORMS. THE LINK OR COMMUNICATION CHANNEL CONDITIONS ARE RELATIVELY BENIGN DURING PEACETIME SURVEILLANCE; HOWEVER, IN THE PRE-, TRANS- AND POST-ATTACK PERIODS THE CHANNEL CONDITION MAY DEGRADE RAPIDLY CAUSING SEVERE LINK DISRUPTIONS. THE APPROACHES TO BATTLE MANAGEMENT, AS THEY ARE TAILORED TO THE VARIOUS ARCHITECTURE OPTIONS BEING CONSIDERED, WILL DEPEND HEAVILY UPON THE COMMUNICATION LINK INTEGRITY. FOR THESE REASONS, THIS PROJECT PROPOSES TO SPECIFY AND DESIGN HARDWARE/SOFTWARE REAL-TIME STRESSED CHANNEL SIMULATORS FOR INCLUSION IN THE BATTLE MANAGEMENT TEST FACILITY. THE SPATIAL AND TEMPORAL EXTENT OF SIGNAL BLACKOUT AND SEVERE SCINTILLATION AS THEY RELATE TO SPECIFIC LINK TYPES INVOLVING SATELLITE, AIRBORNE, AND TERRESTRIAL PLATFORMS WILL BE CHARACTERIZED. BOTH RADIO FREQUENCY SYSTEMS, RANGING FROM UHF TO EHF, AND OPTICAL FREQUENCY SYSTEMS WILL BE CONSIDERED.

TELECOMMUNICATION SCIENCE ASSOCS INC 2560 FIRST AVE - STE 105 SAN DIEGO, CA 92103 DR BARRY EISENBERG TITLE: SINGLE BROADBAND TACTICAL MANPACK RADIO T 25 OFFICE: USMC/LBC	NAVY	\$ 49,422
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IN TACTICAL APPLICATIONS, CRITICAL DATA AND VOICE INFORMATION IS PRESENTLY TRANSMITTED OVER A VARIETY OF MANPACK RADIOS RANGING FROM HF THROUGH UHF. THIS TASK PROPOSES TO DESIGN/DEVELOP A SINGLE MULTI-USER RADIO TO OPERATE IN THIS FREQUENCY RANGE. THIS EFFORT WILL APPLY CURRENT TECHNOLOGY CONCEPTS IN THE DESIGN OF BOTH THE RADIO FREQUENCY AND INFORMATION PROCESSING PORTIONS OF THE RADIO. THE RADIO DESIGN WILL EMPHASIZE DEVICE TECHNOLOGY INVOLVING HIGH SPEED CARRIER SAMPLING AND VLSI DIGITAL SIGNAL PROCESSING CHIPS TO PROVIDE A COMMON RADIO WITH REDUCED SIZE AND WEIGHT.

TELECOMMUNICATION SCIENCE ASSOCS INC 2560 1ST AVE - STE 105 SAN DIEGO, CA 92103 RICHARD P BUCKNER TITLE: INVESTIGATION OF FREQUENCY EFFECTS ON VLF/LF CIRCUITS OPERATING IN NUCLEAR ENVIRONMENTS T 2 OFFICE: AM/SBIR	DNA	\$ 60,765
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RECENT INVESTIGATIONS BY THE DNA NUCLEAR-EFFECTS COMMUNITY HAVE

FISCAL YEAR 1986

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IDENTIFIED VLF/LF LINK TRANSMISSION FREQUENCY AS A SIGNIFICANT PARAMETER INFLUENCING LONGWAVE COMMUNICATIONS EFFECTIVENESS IN MEECN/ WWMCCS APPLICATIONS. THIS PROPOSED PROJECT WILL ADDRESS IN DETAIL THE EFFECTS OF FREQUENCY SELECTION ON SUCH CIRCUITS OPERATING IN PEACETIME AND NUCLEAR ENVIRONMENTS, THROUGH EXPLORATORY DEVELOPMENT OF MODELS TO DEFINE PROPAGATION EFFECTS OVER AREAS OF VARYING GROUND CONDUCTIVITY AND AT VARIOUS DISTANCES. THE INVESTIGATION WILL TREAT GENERALIZED LONGWAVE TRANSMISSION IN THE NORTHERN HEMISPHERE, BUT WILL ALSO FOCUS ON EMISSIONS FROM SPECIFIC VLF/LF AIRBORNE TRANSMITTERS OF INTEREST TO THE DEFENSE COMMUNITY. BOTH TE AND TM TRANSMISSIONS WILL BE ANALYZED, AND EFFECTS ON BOTH SIGNALS AND ATMOSPHERIC NOISE LEVELS WILL BE CONSIDERED. UTILIZING PROPAGATION DATA FROM EXISTING DNA LONGWAVE DATABASES, THE INVESTIGATION WILL DEVELOP AND REFINE COMPUTER MODELING TECHNIQUES TO DETERMINE GENERIC FREQUENCY EFFECTS AND WILL APPLY THESE RESULTS TO EXAMPLE CIRCUITS FROM WWMCCS AIRBORNE TRANSMISSIONS. THE PHASE I INVESTIGATION WILL PRODUCE A FINAL REPORT AND RECOMMENDATIONS FOR PHASE II EFFORT, AND AN ILLUSTRATED BRIEFING OF RESULTS.

TELEMECHANICS INC  
335 PAINT BRANCH DR  
COLLEGE PARK, MD 20742  
DR HARRI G PRIVAL

AF

\$ 53,328

## TITLE:

DIGITAL TERRAIN DATA STORAGE AND RETRIEVAL SYSTEM

T 123

OFFICE: AFWAL/AA

THIS PROPOSAL OUTLINES A TOPOGRAPHIC OR TERRAIN ELEVATION DATA STORAGE AND RETRIEVAL SYSTEM WHICH ACHIEVES SUPERIOR PERFORMANCE BY THE USE OF DATA COMPRESSION. A PROMISING COMPRESSION TECHNIQUE IS OUTLINED. WHILE THE DESIGN OF THE "ON LINE" DECOMPRESSION HARDWARE IS FAIRLY STRAIGHTFORWARD, THE OFF LINE COMPRESSION OF THE SOURCE DATA, WHICH IS BLOCKED AND RECTIFIED DEFENSE MAPPING AGENCY LEVEL 1 ELEVATION DATA, INVOLVES SOME NON TRIVIAL PROBLEMS. TWO OF THESE PROBLEMS, NAMELY EFFICIENT MEANS OF EXTRACTING LARGE "KEYS" (IN THE CRYPTOGRAPHIC SENSE) FROM THE DATA BASE, AND SECOND, USING THESE KEYS TO EFFICIENTLY ENCODE THE SOURCE DATA WILL BE INVESTIGATED USING COMPUTER SIMULATION. THE RESULTS EXPECTED SHOULD MAKE POSSIBLE AN ELEVATION DATA STORAGE AND RETRIEVAL SYSTEM WITH A CAPACITY IN THE VICINITY OF 1 MILLION SQUARE MILES, AN ACCURACY COMMENSURATED WITH THAT OF THE SOURCE DATA, AN ACCESS TIME FAST ENOUGH FOR USE ON BOARD

FISCAL YEAR 1986

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AIRCRAFT, AND A SIZE, WEIGHT, AND POWER CONSUMPTION SUITABLE FOR  
USE ABOARD EVEN FIGHTER AIRCRAFT.

TELEPHOS ASSOC. 44 ST. JAMES CT. PHILADELPHIA, PA 19106 HARALAMBOS N. KRITIKOS TITLE: ULTRAHIGH RESOLUTION PASSIVE MICROWAVE IMAGING T 3 OFFICE:	SDIO	\$ 50,000
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THE PROPOSED WORK WILL DEVELOP A CONCEPT FOR AN ULTRAHIGH RESOLUTION  
PASSIVE MICROWAVE IMAGING SYSTEM TO BE USED FOR THE IDENTIFICATION  
AND DETECTION OF BALLISTIC MISSILES. THE CONCEPT IS BASED ON THE  
IMAGING TECHNIQUES USED IN THE RADIO ASTRONOMICAL COMMUNITY. THE  
PROPOSED SYSTEM WILL BE SPACE BORN AND WILL BE TOTALLY PASSIVE WITH  
A LOW STEALTH PROFILE.

TESCO, INC. 104 W. MOORE ST., P.O. BOX 895 TULLAHOMA, TN 37388 LEE F. WEBSTER TITLE: GASEOUS PROPELLANT COMPRESSOR TECHNOLOGY T 6 OFFICE:	SDIO	\$ 70,718
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DEPLOYMENT OF DEFENSIVE WEAPONS IN THE SPACE ENVIRONMENT CALLS FOR  
ADVANCED PROPULSION SYSTEMS WITH HIGH ISP AND THE CAPABILITY FOR LONG  
TERM DEPLOYMENT, ON STATION AT VARIOUS ORBIT LEVELS. HIGH ISP MEANS  
EXPLOITATION OF THE PERFORMANCE POTENTIAL OF LIQUID HYDROGEN FUELS.  
LONG TERM DEPLOYMENT REQUIRES HIGH PROPELLANT SPECIFICS, LOW VEHICLE  
WEIGHTS AND UTILIZATION OF THE TOTAL ENERGY POTENTIAL OF "ON BOARD"  
PROPELLANTS. ONE WAY TO MINIMIZE THESE PARAMETERS IS THE USE OF A  
COMMON PROPELLANT SUPPLY FOR ORBIT TRANSFER AND SPACECRAFT, ATTITUDE  
CONTROL ENGINES. TO MAKE HYDROGEN USABLE IN SUCH A SYSTEM, IT IS  
DESIRABLE TO USE HIGH PRESSURE GASES IN THE ATTITUDE CONTROL ENGINES.  
THIS CAN BE ACCOMPLISHED BY THE DEVELOPMENT OF AN ELECTRICALLY DRI-  
VEN, GASEOUS PROPELLANT COMPRESSOR TO COMPRESS BOILOFF GASES FROM THE  
MAIN PROPELLANT TANKS. TO BE SUCCESSFUL, TECHNOLOGY MUST BE DEVE-  
LOPED FOR THE DESIGN OF A PUMP CAPABLE OF UP TO 100 TO 1 PRESSURE

FISCAL YEAR 1986

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RATIOS AT NEAR CRYOGENIC INLET TEMPERATURES. THE PUMP MUST BE LEAK PROOF AND CAPABLE OF OPERATION FOR AT LEAST 10,000 HOURS WITHOUT OVERHAUL. MATERIAL FOR SEALS, VALVES AND BEARING MUST BE FOUND OR DEVELOPED. FINALLY, THE TECHNOLOGY NEEDS TO BE DEMONSTRATED BY OPERATION OF A PROTOTYPE PUMP IN A FOLLOW-ON DEVELOPMENT PHASE.

TETRA CORP. 4905 HAWKINS NE ALBUQUERQUE, NM 87109 WILLIAM M. MOENY TITLE: HIGH REPETITION RATE GLOW DISCHARGE CLOSING SWITCH DEVELOPMENT PROGRAM T 5 OFFICE:	SDIO	\$ 59,698
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THE DEVELOPMENT OF HIGH POWER, HIGH REPETITION RATE CLOSING SWITCHES HAS RECENTLY BECOME IMPORTANT FOR MANY PULSED POWER APPLICATIONS. HISTORICALLY, HIGH REPETITION RATE SWITCHES FOR PULSED POWER APPLICATIONS HAVE EITHER BEEN SPARK GAPS OR THYRATRONS. THYRATRONS HAVE HIGH REPETITION RATES, BUT ARE LIMITED TO LOW VOLTAGES AND LOW CURRENT. CONVERSELY, SPARK GAPS CAN CARRY HIGH CURRENTS AND STAND-OFF HIGH VOLTAGES, BUT THE REPETITION RATE IS LOW. WE PROPOSE THE DEVELOPMENT OF A SWITCH THAT FILLS THE VOID BETWEEN THYRATRONS AND SPARK GAPS. WITH THE SELF-SUSTAINED UV PRE-IONIZED GLOW DISCHARGE SWITCH, WE SHOULD BE ABLE TO DEVELOP VOLTAGE STAND-OFFS OF 200-500 kV, CONDUCTION CURRENTS OF 200-500 kA, AND HIGH REPETITION RATES. OUR PROPOSAL IS BASED ON EXPERIMENTS THAT WE CONDUCTED FOR THE AIR FORCE WEAPONS LABORATORY STUDYING THE FEASIBILITY OF FAST AVALANCHE-CONTROLLED DISCHARGES FOR THE INITIATION OF PULSED HF LASERS. EXPERIENCE AND DATA FROM OUR UV-SUSTAINED GLOW DISCHARGE OPENING SWITCH PROGRAM IS ALSO DIRECTLY APPLICATIONAL. THE ANTICIPATED RESULTS OF PHASE I ARE THE DETERMINATION OF THE FEASIBILITY OF THE SWITCH FROM THE EXPERIMENTAL DEMONSTRATION OF GAS MIXTURES THAT YIELD SWITCH RATIOS GREATER THAN TWO.

TETRA CORP. 4905 HAWKINS, NE ALBUQUERQUE, NM 87109 WILLIAM M. MOENY TITLE: ENHANCED ELF COMPUTER CODES DEVELOPMENT T 5 OFFICE:	SDIO	\$ 56,098
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MANY OF THE SYSTEMS FOR SDI INVOLVE PULSE POWER AND HIGH VOLTAGE

FISCAL YEAR 1986

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<p>SYSTEMS, INCLUDING LASERS, PARTICLE BEAM ACCELERATORS, AND RAILGUNS. ONE OF THE SIGNIFICANT PROBLEMS YET TO BE SOLVED IN DEVELOPING OPERATIONAL SDI SPACECRAFT IS THE MANAGEMENT OF ELECTRIC FIELDS WITHIN THE SPACECRAFT, THE PRIMARY WEAPON SYSTEM, AND ITS POWER SUPPLY AND CONDITIONING EQUIPMENT. THE ELF CODES UNIQUELY HAVE THE ABILITY TO ACCURATELY ANALYZE ELECTRIC FIELDS PRODUCED BY ARTITRATILY SHAPED CONDUCTORS IN THE PRESENCE OF NON-UNIFORM TIME VARYING PLASMAS, BUT MUST BE EXTENDED TO INCLUDE DIELECTRICS. TRADITIONAL COMPUTER CODES DO NOT HAVE THE CAPABILITY OF ACCURATELY ANALYZING ELECTRIC FIELDS NEAR CONDUCTORS, ESPECIALLY UNUSUALLY SHAPED CONDUCTORS. TETRA CORPORATION PROPOSES TO EXTEND THE DEVELOPMENT OF ITS ELF (ELECTRIC FIELD ANALYSIS) COMPUTER CODES TO INCLUDE DIELECTRIC AND A NEW MULTI-GRID GENERATOR FOR THE SOLUTION OF THESE AND SIMILAR PROBLEMS FOR THE STRATEGIC DEFENSE INITIATIVE. THE ELF CODES WITH DIELECTRICS REPRESENT A CRITICAL TOOL NEEDED BY THE OIST POWER CONSORTIUM. THE ELF CODES ARE UNIQUELY SUITED FOR THIS APPLICATION AND REPRESENT AN OPPORTUNITY FOR SDIO TO MAKE A SIGNIFICANT ADVANCEMENT IN THE CAPABILITY OF MODELING THE ELECTRIC FIELDS AND DESIGNING PULSE POWER SYSTEMS AND SUPPORT EQUIPMENT FOR SPACE APPLICATIONS.</p>		

TEXAS RESEARCH INSTITUTE INC  
9063 BEE CAVES RD  
AUSTIN, TX 78733  
DR PATRICK E CASSIDY

ARMY

\$ 49,973

## TITLE:

IMPROVED MOISTURE RESISTANT POTTING MATERIALS/TECHNIQUES FOR  
IMAGE INTENSIFIERS

T 64

OFFICE: CECOM/AMSEL

THIS PROPOSAL DESCRIBES AN SBIR PROJECT TO INVESTIGATE ALTERNATIVE MATERIALS AND PROCESSING TECHNIQUES TO IMPROVE MOISTURE RESISTANCE CHARACTERISTICS OF IMAGE INTENSIFIERS. RELIABILITY OF IMAGE INTENSIFIERS IS NOW AFFECTED BY MOISTURE PENETRATION INTO THE INTENSIFIER ASSEMBLY, WHICH IS POTTED WITH RTV SILICONE. THE APPROACH PROPOSED IS TO INVESTIGATE COMMERCIALY AVAILABLE MATERIALS TO REPLACE THE SILICONE COMPOUNDS NOW USED. IN PARTICULAR, THIS PROJECT WILL DETERMINE THE FEASIBILITY OF USING POLYURETHANE AS AN ALTERNATIVE TO SILICONE. A MARKET SURVEY WILL BE CONDUCTED TO IDENTIFY MATERIALS WHICH MEET PROCESSING AND PERFORMANCE REQUIREMENTS FOR THE IMAGE INTENSIFIER POTTING COMPOUND. METHODS TO IMPROVE ADHESION OF IMAGE INTENSIFIER COMPONENTS TO THE ENCAPSULANT WILL BE INVESTIGATED.



FISCAL YEAR 1986

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ACCELERATED AGING TECHNIQUES WILL BE USED TO SCREEN POTENTIAL CANDIDATE MATERIALS UNDER SIMULATED SERVICE CONDITIONS IN THE LABORATORY. THE RESULT OF THIS EFFORT WILL BE RECOMMENDATION OF 3-5 MATERIALS FOR FURTHER TESTING.

TEXAS RESEARCH INSTITUTE INC 9063 BEE CAVES RD AUSTIN, TX 78733 DR CECIL M TELLER TITLE: NDE OF ADHESIVE BONDS T 6	NAVY	\$ 48,144
OFFICE: ONR		

THE OVERALL GOAL OF THIS RESEARCH IS TO DEVELOP AN INNOVATIVE NON-DESTRUCTIVE (NONINVASIVE) INSPECTION TECHNIQUE THAT CAN DETERMINE WHETHER OR NOT DURABLE ADHESIVE BONDS HAVE BEEN FORMED IN RUBBER-TO-METAL JOINTS AND WHETHER A BOND THAT HAS BEEN EXPOSED TO USE CONDITIONS CONTAINS ITS INTEGRITY. THE PHASE I EFFORT WILL IDENTIFY, DESCRIBE AND EVALUATE THE CONDITIONS FOR EXCITING BOND SENSITIVE ACOUSTIC WAVES, IN PARTICULAR LAMB WAVES, IN RUBBER/METAL LAMINATES RELEVANT TO NAVY APPLICATIONS AND ASSESS THE SENSITIVITY OF WAVE PARAMETERS TO VARIOUS DEGREES OF ADHESION BETWEEN THE MATERIALS. SPECIFIC TECHNICAL OBJECTIVES ARE: 1) TO DETERMINE THE THICKNESS-TO-WAVELENGTH LIMIT FOR EXCITATION OF LEAKY LAMB (PLATE) WAVES (THE THICKNESS OF THE ADHERENDS AS WELL AS THE ADHESIVE LAYER WILL BE EXAMINED); 2) TO APPLY EXISTING THEORIES OF WAVE EXCITATION AND PROPAGATION IN LAYERED MEDIA TO BONDED RUBBER-TO-METAL STRUCTURES; 3) TO IMPLEMENT A QUANTIFIABLE METHOD FOR PRODUCING DIFFERENT DEGREES OF BOND ADHESION IN RUBBER/METAL LAMINATES; AND 4) TO DETERMINE THE SENSITIVITY LIMITS OF LEAKY LAMB WAVE METHODOLOGY TO INITIAL BOND QUALITY AND TO CHANGES IN BOND QUALITY, WHERE QUALITY IS DEFINED BY A MEASURE OF ADHESION. ACCELERATED AGING WILL BE EMPLOYED TO EVALUATE ENVIRONMENTAL EXPOSURE EFFECTS.

TEXTILE TECHNOLOGIES INC 2800 TURNPIKE DR HATBORO, PA 19040 JANICE R MAIDEN TITLE: ANGULAR WEAVING TECHNIQUES FOR TURBIN COMPONENTS ASSESSMENT T 175	AF	\$ 33,845
OFFICE: AFWAL/PO		

ADVANCED AIRCRAFT ENGINES REQUIRE ADVANCED MATERIALS TO MEET THEIR

FISCAL YEAR 1986

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GOALS OF PERFORMANCE, THRUST-TO-WEIGHT RATIO AND FUEL EFFICIENCY. FIBER REINFORCED COMPOSITE MATERIALS OFFER THE OPPORTUNITY FOR GAINS IN PERFORMANCE AND WEIGHT REDUCTION THROUGH THE DEVELOPMENT OF STIFFERS, STRONGER AND LIGHTER WEIGHT MATERIALS CAPABLE OF WITHSTANDING HIGHER OPERATION TEMPERATURES. MANY AREAS WHERE COMPOSITE MATERIALS HAVE ENHANCED STRUCTURAL PERFORMANCE ARE CITED. AN INHERENT LIMITATION OF CONVENTIONAL WEAVING TECHNIQUES IS THE INABILITY TO PROVIDE OFF-AXIS OR "ANGULAR" FIBER ORIENTATION, (I.E., +/-45 DEG). THIS PROGRAM WILL ADDRESS THREE WEAVING TECHNIQUES WHICH HAVE POTENTIAL FOR PROVIDING MULTIANGULAR FIBER ORIENTATIONS FOR COMPOSITE MATERIALS FOR TURBINE ENGINE COMPONENTS. WEAVING COSTS, PREFORM PROCESSING COSTS, COMPOSITE PROPERTIES, PROCESS FLEXIBILITIES, PROCESS LIMITATIONS, ABILITY TO PRODUCE COMPLEX SHAPES WILL BE ASSESSED. A WEAVING PLAN WILL BE DEVELOPED FOR EACH PROCESS INCLUDING A COST ANALYSIS FOR REPRESENTATIVE PARTS. A FINAL REPORT WILL BE PROVIDED TO SUMMARIZE THIS EFFORT AND PROVIDE GUIDELINES FOR FURTHER PHASE II DEVELOPMENT.

TEXTILE TECHNOLOGIES INC  
2800 TURNPIKE DR  
HATBORO, PA 19040  
JANICE R MAIDEN

ARMY

\$ 45,051

## TITLE:

LOW COST COMPOSITE REINFORCEMENTS FOR AIRCRAFT STRUCTURES  
T 40 OFFICE: AVSCOM/AMSAV

THE EVOLUTION OF THE AIRCRAFT INDUSTRY HAS BEEN CHARACTERIZED BY A STEADY PROGRESSION TOWARD THE USE OF LIGHTWEIGHT MATERIALS STRONG ENOUGH TO WITHSTAND THE INCREASING DEMANDS PLACED ON TODAY'S HIGH PERFORMANCE AIRCRAFT. HOWEVER, CONVENTIONAL COMPOSITE FABRICATION TECHNIQUES ARE VERY LABOR INTENSIVE AND COSTLY. INNOVATIVE TEXTILE WEAVING TECHNIQUES OFFER GREAT POTENTIAL TO REDUCE COMPOSITE FABRICATION COSTS OF NEXT GENERATION AIRCRAFT. THIS PROGRAM IS DESIGNED TO ADDRESS STATE-OF-THE-ART WEAVING TECHNIQUES TO PROVIDE LOW-COST COMPOSITE REINFORCEMENT FOR STRUCTURAL COMPONENTS. AN INTEGRALLY WOVEN MULTIPLE STIFFENED COMPOSITE PANEL, WILL BE DESIGNED, FABRICATED AND TESTED AND COMPARED TO A CONVENTIONAL COMPOSITE PANEL TO DEMONSTRATE THE FEASIBILITY OF THE WEAVING (PREFORMING) TECHNIQUE. THE PANEL DESIGN WILL BE REPRESENTATIVE OF A STIFFENED STRUCTURAL COMPONENT FOR THE TAIL CONE OF A TYPICAL HELICOPTER AIRFRAME. A FINAL REPORT WILL BE PROVIDED TO SUMMARIZE DETAILED DESIGN OF THE WOVEN PREFORMS, WEAVING COSTS, PREFORM PROCESSING COSTS, PROCESS

FISCAL YEAR 1986

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SPECIFICATIONS AND TEST RESULTS, ALONG WITH GUIDELINES FOR FURTHER  
PHASE II DEVELOPMENT.

THERMACORE INC 780 EDEN RD LANCASTER, PA 17601 JEROME E TOTH TITLE: HIGH TEMPERATURE HEAT PIPE TECHNOLOGY T 51 OFFICE: RADC/DOR	AF	\$ 63,000
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IN THE ELECTRONICS INDUSTRY THERE EXISTS AN EVER INCREASING DEMAND FOR ULTRA HIGH PURITY SINGLE CRYSTAL MATERIALS. THERMAL FLUXUATION IN THE FURNANCE DURING THE CRYSTAL'S GROWTH OR IMPURITIES WHICH REMAIN WITHIN THE CRYSTAL CAN DRASTICALLY EFFECT THE MORPHOLOGY AND INTURN, NEGATIVELY EFFECT THE MATERIALS ELECTRICAL CHARACTERISTICS. ACCORDINGLY, THERE EXISTS A STRONG INCENTIVE TO DEVELOP IMPROVED PROCESSES FOR THE GROWTH AND PURIFICATION OF SINGLE CRYSTAL MATERIALS FOR THE SEMICONDUCTOR INDUSTRY, PARTICULARLY IN THE MANUFACTURE OF GALLIUM-ARSENIDE, INDIUM-PHOSPHOROUS AND SILICON. A DEMONSTRATED EFFECTIVE APPROACH TO THE MANUFACTURE OF THESE AND OTHER SINGLE CRYSTAL MATERIALS IS THE USE OF A VERTICAL GRADIENT FREEZE FURNACE. THE USE OF A SERIES OF LIQUID METAL HEAT PIPES TO FORM THE FURNACE OFFERS THE POTENTIAL FOR SUBSTANTIAL IMPROVEMENTS IN THERMAL CONTROL OVER CONVENTIONAL DESIGNS, PARTICULARLY WITH THE HEAT PIPE'S NEAR ISOTHERMAL HEATING CAPABILITY.

THERMACORE INC 780 EDEN RD LANCASTER, PA 17552 JEROME TOTH TITLE: PASSIVE VARIABLE THERMAL RESISTANCE TECHNIQUES T 145 OFFICE: NWSC	NAVY	\$ 49,943
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SOME MISSILE INERTIAL GUIDANCE SYSTEMS USE THE MISSILE STRUCTURE AS A HEAT SINK. THE HEAT SINK TEMPERATURE CHANGES DURING THE ELAPSED TIME BETWEEN LAUNCH AND WHEN THE MISSILE BECOMES BALLISTIC. THIS CHANGE IN TEMPERATURE RESULTS IN A CHANGE IN GUIDANCE SYSTEM TEMPERATURE WHICH IN TURN CAUSES TEMPERATURE INDUCED MISALIGNMENTS AND RE-

FISCAL YEAR 1986

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SULTING NAVIGATION SYSTEM ERRORS. THIS PROPOSAL DESCRIBES A PROGRAM TO DEVELOP A PASSIVE VARIABLE THERMAL RESISTANCE SUITABLE FOR MISSILE INERTIAL GUIDANCE SYSTEMS. THE INTENT IS TO DECREASE THERMAL RESISTANCE AS THE HEAT SINK TEMPERATURE INCREASES THERBY MAINTAINING NEARLY CONSTANT GUIDANCE SYSTEM TEMPERATURES. THE PROPOSED WORK PROGRAM IS BASED ON USING GAS CONTROLLED HEAT PIPE TECHNOLOGY. IT COVERS DEFINITION OF REQUIREMENTS THRU ANALYSES, FABRICATION AND TEST OF PROOF-OF-PRINCIPLE HARDWARE.

THERMACORE, INC. 780 EDEN RD. LANCASTER, PA 17601 NELSON J. GERNERT TITLE: HEAT PIPE TECHNOLOGY FOR ACTIVE HARDENING AGAINST DIRECTED ENERGY DEVICES T 7 OFFICE:	SDIO	\$ 49,419
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DIRECTED ENERGY WEAPONS HAVE THE POTENTIAL FOR ATTACKING THE VARIOUS COMPONENTS OF A SPACE-BASED MISSILE DEFENSE SYSTEM. THE SURVIVABILITY OF THE VARIOUS COMPONENTS OF THE SPACE-BASED MISSILE DEFENSE SYSTEM WILL BE A KEY ISSUE IN THE EFFECTIVENESS OF SUCH A SYSTEM. ACCORDINGLY THERE IS A STRONG INCENTIVE TO DEVELOP PROTECTIVE SYSTEMS WHICH WILL ALLEVIATE OR NEGATE THE DAMAGING EFFECTS OF THESE WEAPONS. A POTENTIALLY EFFECTIVE APPROACH, FOR THE PROTECTION OF SPACE-BASED STRUCTURES FROM DIRECTED ENERGY WEAPONS, IS THE UTILIZATION OF HEAT PIPES OR HEAT PIPE PRINCIPLES WITHIN A SHIELD STRUCTURE. IT IS THE OBJECTIVE OF THE PROPOSED PROGRAM TO DEMONSTRATE HEAT PIPE TECHNOLOGY FOR USE IN ACTIVE HARDENING AGAINST DIRECTED ENERGY DEVICES. THE SHIELD STRUCTURE COULD BE DESIGNED TO ABSORB THE ENERGY IN THE AREA COVERED BY THE ENERGY BEAM AND TRANSPORT THE GENERATED HEAT FOR DISSIPATION OVER THE ENTIRE SURFACE OF THE STRUCTURE BEING PROTECTED. THE ABSORBED ENERGY WOULD BE DISSIPATED BY A COMBINATION OF HEATING THE SHIELD STRUCTURE AND RADIATION FROM THE SURFACE OF THE SHIELD TO SPACE.

THERMACORE, INC. 780 EDEN RD. LANCASTER, PA 17601 JEROME E. TOTH TITLE: HIGH TEMPERATURE CAPILLARY PUMPED LOOP HEAT PIPE T 4 OFFICE:	SDIO	\$ 49,799
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DESIGNS FOR SPACE BASED STRUCTURES ARE BECOMING INCREASINGLY LARGER

FISCAL YEAR 1986

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AND MORE COMPLEX. AS THESE STRUCTURES GROW, THEIR LEVEL OF POWER CONSUMPTION IS ALSO INCREASING. TO SATISFY THIS DEMAND FOR POWER, ENERGY SYSTEMS, SUCH AS THE SP-100 ARE BEING DESIGNED TO MEET THE ANTICIPATED REQUIREMENTS. THE POWER GENERATION SYSTEM CONCEPTS ARE CURRENTLY BEING REVIEWED FOR AREAS WHERE IMPROVEMENTS CAN BE MADE SO THAT THESE SYSTEMS CAN PERFORM THEIR SERVICE FUNCTION WITH AS LITTLE COST, IN TERMS OF WEIGHT, ENERGY EFFICIENCY, COMPLEXITY, ETC, AS IS FEASIBLE. THE CURRENT SP-100 DESIGN CONCEPT INCLUDES THE USE OF MAGNETIC HYDRODYNAMIC PUMPS FOR THE CIRCULATION OF A LITHIUM COOLANT THROUGH THE PRIMARY HEAT EXCHANGE LOOP. THIS LOOP TRANSFERS THE HEAT FROM THE REACTOR CORE TO THE T/E MODULES WHERE IT IS EXTRACTED FOR CONVERSION TO ELECTRICAL ENERGY OR DISSIPATION. THESE MHD PUMPS ARE INEFFICIENT AND MASSIVE (HEAVY) DEVICES. ACCORDINGLY, THE INCENTIVE EXIST FOR THE IDENTIFICATION OF AN ALTERNATE COOLANT CIRCULATION PROCESS. THE HIGH TEMPERATURE CAPILLARY PUMP LOOP HEAT PIPE, A PASSIVE, LOW MASS DEVICE OFFERS ONE ALTERNATIVE TO THE USE OF MHD PUMPS.

THERMACORE, INC.

SDIO

\$ 49,620

780 EDEN RD.

LANCASTER, PA 17601

JEROME E. TOTH

TITLE:

TWO PHASE COOLING OF OPTICS

T 1 OFFICE:

THERMACOR PROPOSES TO APPLY TWO PHASE COOLING TECHNIQUES TO HIGH POWER OPTICAL COMPONENTS. LOW JITTER, LOW DISTORTION AND LOW POWER CONSUMPTION ARE ANTICIPATED.

THERMEX ENERGY CORP

NAVY

\$ 50,344

13601 PRESTON RD - STE 900 W

DALLAS, TX 75240

DR DAN WASSON

TITLE:

SLURRY/TNT HYBRID POTENTIAL FOR INSENSITIVE HIGH EXPLOSIVE (IHE) FORMULATIONS

T 62 OFFICE: NAVSEA

THE MECHANISM BY WHICH HALOGENATED AGENTS ACTS AS FLAME SUPPRESSANTS HAS BEEN THE SUBJECT OF EXTENSIVE RESEARCH FOR ABOUT 35 YEARS. THE

FISCAL YEAR 1986

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AMOUNT

UNDERGROUND MINING INDUSTRY LOOKING FOR A WAY TO BLAST IN UNDERGROUND MINE SHAFTS OFTEN RICH IN METHANE GAS HAVE USED THIS CONCEPT IN THEIR DEVELOPMENT OF "PERMISSIBLE EXPLOSIVES." BY ADDING SALTS TO STANDARD EXPLOSIVES FORMULATIONS, THE FIREBALL CAUSED BY A DETONATION CAN BE SNUFFED OUT BEFORE THE METHANE GAS IS IGNITED (ADEQUATE STEMMING IS ALSO REQUIRED). THE SEQUENCE OF EVENTS OCCURRING IN THE ACCIDENTAL DETONATION OF AN EXPLOSIVE CAUSED BY LOW ENERGY STIMULI, IS THE INITIALLY A DEFLAGRATION OCCURS WHICH OFTEN PROGRESSES ALMOST INSTANTLY INTO A DETONATION. IT IS THE HYPOTHESIS OF THERMEX ENERGY CORPORATION THAT IF HALOGENATED AGENTS WERE INTRODUCED INTO STANDARD MILITARY MUNITION FILLS, THERE IS A REASONABLE EXPECTATION THAT SENSITIVITY TO LOW ENERGY STIMULI AND FIRE COULD BE REDUCED. THE ACCIDENTAL LOW ENERGY STIMULI WOULD TRIGGER THE RELEASE OF HALOGEN IONS (RADICALS) AT THE SAME INSTANT IT INITIATED THE DEFLAGRATION. THE HALOGEN IONS BEING MORE ACTIVE AND HAVING THE OPPOSITE POLARITY WOULD TEND TO TAKE THE IONS OF COMBUSTION OUT OF THE REACTION COMBINING WITH THEM TO FORM AN INERT COMPOUND, SNUFFING OUT THE FLAME.

THERMEX ENERGY CORP  
13601 PRESTON RD - STE 900W  
DALLAS, TX 75240  
DR DAN WASSON

ARMY

\$ 50,245

TITLE:

DESENSITIZING COMPOSITION B THROUGH HALOGENATION

T 5 OFFICE: ARDC/SMCAR

THE MECHANISM BY WHICH HALOGENATED AGENTS ACT AS FLAME SUPPRESSANTS HAS BEEN THE SUBJECT OF EXTENSIVE RESEARCH FOR ABOUT 35 YEARS. THE UNDERGROUND MINING INDUSTRY LOOKING FOR A WAY TO BLAST IN UNDERGROUND MINE SHAFTS OFTEN RICH IN METHANE GAS HAVE USED THIS CONCEPT IN THEIR DEVELOPMENT OF "PERMISSIBLE EXPLOSIVES." BY ADDING SALTS TO STANDARD EXPLOSIVES FORMULATIONS, THE FIREBALL CAUSED BY A DETONATION CAN BE SNUFFED OUT BEFORE THE METHANE GAS IS IGNITED (ADEQUATE STEMMING IS ALSO REQUIRED). THE SEQUENCE OF EVENTS OCCURRING IN THE ACCIDENTAL DETONATION OF AN EXPLOSIVE CAUSED BY LOW ENERGY STIMULI, IS THAT INITIALLY A DEFLAGRATION OCCURS WHICH OFTEN PROGRESSES ALMOST INSTANTLY INTO A DETONATION. IT IS THE HYPOTHESIS OF THERMEX ENERGY CORPORATION THAT IF HALOGENATED AGENTS WERE INTRODUCED INTO STANDARD MILITARY MUNITION FILLS, THERE IS A REASONABLE EXPECTATION THAT SENSITIVITY TO LOW ENERGY STIMULI AND FIRE COULD BE REDUCED. THE ACCIDENTAL LOW ENERGY STIMULI WOULD TRIGGER THE RELEASE OF HALOGEN

FISCAL YEAR 1986

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IONS (RADICALS) AT THE SAME INSTANT IT INITIATED THE DEFLAGRATION. THE HALOGEN IONS BEING MORE ACTIVE AND HAVING THE OPPOSITE POLARITY WOULD TEND TO TAKE THE IONS OF COMBUSTION OUT OF THE REACTION COMBINING WITH THEM TO FORM AN INERT COMPOUND, SNUFFING OUT THE FLAME.

TIBURON SYSTEMS INC 2085 HAMILTON AVE SAN JOSE, CA 95125 DR SARAH E STEAD TITLE: HIERARCHICAL DATA STRUCTURES FOR A DIGITAL TERRAIN MAP SYSTEM T 123 OFFICE: AFWAL/AA	AF	\$ 56,000
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THE USE OF DIGITAL TERRAIN DATA IN APPLICATION AREAS SUCH AS MISSION ROUTE PLANNING AND FLIGHT SIMULATION REQUIRES EFFICIENT DATA STORAGE TECHNIQUES FOR REAL-TIME RETRIEVAL AND UPDATING. THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP A MICROCOMPUTER-BASED DIGITAL TERRAIN MAP SYSTEM (DTMS) USING HIERARCHICAL DATA STRUCTURES. IN PHASE I, A HIERARCHICAL DATA STRUCTURE USING QUADTREES WILL BE DEVELOPED AND IMPLEMENTED FOR DIGITAL TERRAIN ELEVATION DATA. THE QUADTREE STRUCTURE ALLOWS "GROSS-INFORMATION FIRST" DISPLAY (I.E., THE ENTIRE MAP AREA IS VISIBLE AT ANY LEVEL OF THE TREE, WITH THE LEVEL OF DETAIL INCREASING AS MORE LEVELS ARE TRAVERSED), DATA COMPACTION, AND SELECTIVE ACCESS TO DATA. ALSO DURING PHASE I, THE HARDWARE REQUIREMENTS FOR A LOW POWER, LOW COST, REAL-TIME ACCESS SYSTEM WILL BE ESTABLISHED. IN PHASE II, THE HARDWARE IDENTIFIED IN PHASE I WILL BE INTEGRATED INTO A SYSTEM WHICH CAN BE NETWORKED FOR SIMULTANEOUS ACCESS BY MULTIPLE USERS. THE SOFTWARE WILL BE ENHANCED TO INCLUDE DIGITAL CULTURAL AND THREAT DATA. THE RESULT WILL BE A DTMS SOFTWARE/HARDWARE SYSTEM WHICH CAN BE USED FOR DYNAMIC ROUTE PLANNING OR OTHER APPLICATIONS REQUIRING DIGITAL MAP DATA.

TOYON RESEARCH CORP PO BOX 6890 SANTA BARBARA, CA 92409 CHRIS TRUAX TITLE: AIR DEFENSE FORCE MULTIPLIER CONCEPT T 94 OFFICE: ASD/XR	AF	\$ 49,419
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IN MAY OF 1984, THE ARMY AND AIR FORCE JOINTLY ADOPTED A NEW DOCTRINE

FISCAL YEAR 1986

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CALLED THE AIRLAND BATTLE CONCEPT. IN ADDITION TO OTHER REQUIREMENTS, THIS DOCTRINE CALLED FOR THE EXPANSION OF THE BATTLE SPACE AND THE DEVELOPMENT OF AUTONOMOUS AND SEMI-AUTONOMOUS WEAPON SYSTEMS. IN A RELATED DEVELOPMENT, NATO ADOPTED THE "FOLLOW-ON-FORCES-ATTACK" (FOFA) CONCEPT WHICH SEEKS TO APPLY CURRENT AND EMERGING TECHNOLOGIES TO EXTEND THE BATTLE SPACE TOWARD THE ENEMY REAR. IF SUCCESSFULLY IMPLEMENTED, THIS DOCTRINE WOULD BE A POWERFUL COUNTER TO THE SOVIET OPERATIONAL MANUEVER GROUP (OMG) AS WELL AS SEVERELY DISRUPTIVE TO THE HIGHLY ORGANIZED ORDER OF BATTLE NECESSARY FOR A WARSAW PACT BLITZKRIEG. IN KEEPING WITH BOTH THE AIRLAND AND THE FOFA CONCEPTS, SEVERAL NEW SYSTEMS AND CONCEPTS HAVE BEEN PROPOSED (E.G. DEMON) AND SOME ARE IN ENGINEERING DEVELOPMENT (E.G. SADARM). THIS PROPOSAL IS FOR THE STUDY AND ASSESSMENT OF A NEW CONCEPT NAMED STAND OFF AIR DEFENDER (SOAD) AND DEFINITION OF ITS CRITICAL ATTRIBUTES. THE SOAD WOULD CONSIST OF ONE OR MORE AIR-TO-AIR MISSILES MOUNTED IN AN RPV. ITS PURPOSE WOULD BE TO SEEK OUT ENEMY AIRBORNE ASSETS AND DESTROY THEM. THE SOAD WOULD BE CONTROLLED FROM A REMOTE SITE EITHER ON THE GROUND OR IN THE AIR. AS THE SOAD SYSTEM WOULD HAVE BOTH AN AUTONOMOUS AND A SEMI-AUTONOMOUS MODE, EACH CONTROL SITE COULD HANDLE A LARGE NUMBER OF SOAD'S. IN ADDITION, BY UTILIZING THE AUTONOMOUS MODE, A SOAD COULD CONTINUE ITS MISSION EVEN IF ITS CONTROL CENTER WERE DESTROYED.

TOYON RESEARCH CORP  
PO BOX 6890  
SANTA BARBARA, CA 93160  
JOHN ISE

AF

\$ 49,853

## TITLE:

NUCLEAR EFFECTS ON THREAT OPTICAL SENSOR PERFORMANCE  
T 266 OFFICE: BMO/MYSC

THE IMPROVEMENT OF OPTICAL THREATS IN THE PAST DECADE HAS RAISED QUESTIONS ABOUT CURRENT PENETRATION SYSTEMS EFFECTIVENESS. TAKING THE OFFENSE CONSERVATIVE VIEW OF THE PROBLEM CAN MAKE THE JOB OF THE PENETRATION AID DESIGNER VERY DIFFICULT. A MORE REALISTIC VIEW OF THE PROBLEM MAY SHOW THAT CERTAIN CONCEPTS HAVE MORE MERIT THAN THE CONSERVATIVE VIEW MIGHT INDICATE. ONE IMPORTANT ASPECT OF THESE ENGAGEMENTS WHICH HAS NOT BEEN PREVIOUSLY CONSIDERED IS THE IMPACT OF NUCLEAR EFFECTS ON DEFENSE PERFORMANCE AND THE CONCOMITANT IMPROVEMENT IN PENETRATION SYSTEM PERFORMANCE, SIMPLE RADAR BLACKOUT ANALYSES HAVE BEEN CONSIDERED IN SOME CASES TO DETERMINE LIKELY INTER-



FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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CEPTOR BURST PLACEMENT, BUT THE IMPACT ON ADVANCED OPTICAL SENSOR TRACKING AND DISCRIMINATION PERFORMANCE HAS NOT BEEN TREATED. IN THIS ACTIVITY, AN EXAMINATION OF THESE ISSUES WOULD BE TREATED WHICH WOULD LEAD TO A METHODOLOGY (AND ULTIMATELY A SMALL COMPUTER CODE) FOR DETERMINING PENETRATION SYSTEMS EFFECTIVENESS WITH REALISTIC DEFENSE LIMITATIONS DUE TO NUCLEAR EFFECTS ON SENSOR PERFORMANCE.

TOYON RESEARCH CORP PO BOX 6890 SANTA BARBARA, CA 93160 JOEL R GARBARINO TITLE: NUCLEAR EFFECTS ON THREAT RADAR TRACK DISCRIMINATION PERFORMANCE T 266	AF	\$ 49,945
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OFFICE: BMO/MYSC

THE IMPROVEMENT OF THREAT RADAR TECHNOLOGY IN THE PAST DECADE HAS RAISED QUESTIONS ABOUT CURRENT PENETRATION SYSTEMS EFFECTIVENESS. TAKING THE OFFENSE CONSERVATIVE VIEW OF THE PROBLEM CAN MAKE THE JOB OF THE PENETRATION AID DESIGNER VERY DIFFICULT. A MORE REALISTIC VIEW OF THE PROBLEM MAY SHOW THAT CERTAIN CONCEPTS HAVE MORE MERIT THAN THE CONSERVATIVE VIEW MIGHT INDICATE. ONE IMPORTANT ASPECT OF THESE ENGAGEMENTS WHICH HAS NOT BEEN PREVIOUSLY CONSIDERED IS THE IMPACT OF NUCLEAR EFFECTS ON DEFENSE PERFORMANCE AND THE CONCOMITANT IMPROVEMENT IN PENETRATION SYSTEM PERFORMANCE. SINGLE RADAR BLACKOUT ANALYSES HAVE BEEN CONSIDERED IN SOME CASES TO DETERMINE LIKELY DEFENSE INTERCEPTOR BURST PLACEMENT, BUT THE IMPACT ON DEFENSE TRACKING AND DISCRIMINATION PERFORMANCE HAS NOT BEEN TREATED. IN THIS ACTIVITY, (AND ULTIMATELY A SMALL COMPUTER CODE) FOR DETERMINING PENETRATION SYSTEMS EFFECTIVENESS WITH REALISTIC DEFENSE LIMITATIONS DUE TO NUCLEAR EFFECTS ON SENSOR PERFORMANCE.

TRACER TECHNOLOGIES 5820 OBERLIN DR - STE 203 SAN DIEGO, CA 92121 STEPHEN L KERRIN TITLE: A METHOD OF DETERMINING MOISTURE IN INSULATED COLD WEATHER BOOT EXPLORATORY DEVELOPMENT T 134	ARMY	\$ 49,751
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OFFICE: NRDC

DEVELOPMENT OF A REPLACEMENT FOR THE AN/GSM-83 INSULATED BOOT TEST

FISCAL YEAR 1986

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SET IS PROPOSED. THE METHOD IS BASED ON CHANGES IN DIELECTRIC CONSTANT OF THE INSULATING MATERIAL WHEN WATER PENETRATES THE ELASTOMERIC OUTER COVERING. TWO APPROACHES TO MEASUREMENT OF THIS CHANGE ARE DISCUSSED AND TEST AND EVALUATION METHODS SET FORTH.

TRACER TECHNOLOGIES INC 225 NEEDHAM ST NEWTON, MA 02164 DR FRASER WALSH TITLE: LASER-BASED IN SITU CLADDING WITH SILICON NITRIDE T 117 OFFICE: NSW	NAVY	\$ 49,301
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THE PROPOSED PROGRAM RELATES TO THE DEVELOPMENT OF A LASER-BASED METHOD TO CLAD METALS WITH SILICON-BASED CERAMICS. THE CERAMIC LAYER IS TO BE INTIMATELY BONDED TO THE METAL SURFACE BY IN SITU CERAMIC FORMATION AND REACTION WITH THE METAL SUBSTRATE. SUCH CERAMIC-CLADDED METALS WILL BE LOW-COST, ADVANCED ENGINEERING MATERIALS SUITABLE FOR USE AT HIGH TEMPERATURE UNDER MECHANICAL STRESS. THE OBJECTIVE OF THE PROGRAM IS TO DEMONSTRATE THAT  $\text{SiH}_2$  RADICALS FORMED BY  $\text{CO}_2$ -LASER MRPD OF ARYL SILANES WILL REACT IN SITU WITH Nd:YAG-LASER HEAT-ACTIVATED METAL SURFACES. BY CARRYING OUT THIS PROCESS IN A NITROGEN-GAS RICH ATMOSPHERE, INTIMATELY BONDED COATINGS OF SILICON NITRIDE ON THE METAL SURFACE ARE EXPECTED. THE CORROSION RESISTANCE AND TEMPERATURE STABILITY PROPERTIES OF THIS CLADDED METAL, AS WELL AS SURFACE MORPHOLOGY AND CHEMICAL COMPOSITION, WILL BE INITIALLY EVALUATED IN THE PHASE I PROGRAM.

TRANS-INTERNATIONAL CORP 12902 HEATHER CIR FORT WASHINGTON, MD 20744 WILLIAM VAN BISE TITLE: ULTRA-SENSITIVE NON-SUPERCONDUCTING SENSORS T 63 OFFICE: NAVSEA	NAVY	\$ 44,075
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TEMPERATURE STABLE NON-SUPERCONDUCTING SENSORS WITH  $10^{-12}$  TESLA DIRECTIONAL SENSITIVITY BETWEEN 1 AND 100 Hz ARE REQUIRED. TWO CANDIDATE SYSTEMS, A THREE ORTHOGONAL COIL SYSTEM AND A SPHERICALLY WOUND COIL WITH MU-METAL SHUTTER, WITH ABSOLUTE SENSITIVITY BETTER

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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THAN 10(-10)T WILL BE FABRICATED AND EVALUATED.

TRANSFORM INDEX TECHNOLOGIES INC PO BOX 290428 SAN ANTONIO, TX 78280 P NICHOLAS LAWRENCE TITLE: ANALYSIS OF PSYCHOPHYSIOLOGICAL MEASUREMENTS TO SUPPORT BIOFEEDBACK CONTROL MECHANISMS T 282            OFFICE: AMD/RDO	AF	\$ 50,000
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THE PURPOSE OF THE PROPOSED RESEARCH IS TO DEMONSTRATE A SOFTWARE SYSTEM THAT MAKES CORRELATIONAL/FACTOR TYPE ANALYSES OF LARGE DATA BASES PRACTICAL ON MICROCOMPUTER-CLASS MACHINES, AND IS ABLE TO COMPUTE THE SIGNIFICANCE OF PSYCHOPHYSIOLOGICAL MEASUREMENTS AT A SPEED THAT MAKES REAL-TIME FEEDBACK CONTROL MECHANISMS POSSIBLE. THE SOFTWARE PROTOTYPE DEVELOPED WILL ACCESS A DATA BASE COMPOSED OF A WIDE RANGE OF MEASUREMENTS, ANALYZE THEM TO DISCOVER SIGNIFICANT PATTERNS OF RESPONSE, ABSTRACT "TYPICAL" PATTERNS FOR A VARIETY OF PHYSICAL STATES FOR EACH SUBJECT, AND PROVIDE FOR THE COMPARISON OF NEW MEASUREMENTS WITH THE PREVIOUSLY CONSTRUCTED SET OF "TYPICAL" PATTERNS IN ORDER TO PROVIDE INPUT FOR THE CONTROL OF SUBSEQUENT EXTERNAL EVENTS.

TRANSITIONS RESEARCH CORP 15 DURANT AVE BETHEL, CT 06801 ROBERT CROSTON TITLE: INTERACTIVE NECK FOR TEST MANIKINS T 279            OFFICE: AMD/RDO	AF	\$ 51,714
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THE GOAL OF THIS PROJECT IS TO DEVELOP AN INTERACTIVE NECK FOR EJECTION SYSTEM TESTING MANIKIN MADE UP OF COMPLEMENTARY SETS OF FLEXIBLE INFLATABLE BLADDER ACTUATORS (ARTIFICIAL MUSCLES) WORKING ON A COLUMN OF JOINTS WITH RESILIENT INTERSPACED DISCS HELD WITHIN THEIR NORMAL DEGREES OF MOVEMENT BY SYNTHETIC LIGAMENT-LIKE ENVELOPES (ARTIFICIAL NECK STRUCTURE) TO PROVIDE THE MOST DYNAMIC AND REALISTIC SIMULATION OF FORM AND FUNCTION OF THE HUMAN NECK. NOT ONLY CAN EXTERNAL FORCES BE MEASURED BY PROPER PLACEMENT AND INTEGRATION OF

FISCAL YEAR 1986

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AMOUNT

MULTIAXIS FORCE TRANSDUCERS FEEDING SIGNALS TO THE NECK'S COMPUTER, BUT ALSO PREDETERMINED MUSCLE REACTIONS TO EXTERNALLY APPLIED VERTICAL, HORIZONTAL AND TORSIONAL FORCES CAN BE COMPUTED TO GENERATE ARTIFICIAL MUSCLE FORCES WITHIN THE INTERACTIVE NECK TO SIMULATE THE BIOFIDELITY OF HUMAN NECK RESPONSE. THE IMMEDIATE GOAL TO BE DEMONSTRATED IN PHASE I, IS THE DESIGN AND DEVELOPMENT OF A SINGLE ARTIFICIAL MUSCLE SET TO WORK ON A SINGLE DEGREE OF FREEDOM COLUMN OF JOINTS INTEGRATED WITH FORCE FEEDBACK SENSORS COMPUTER CONTROLLED TO TEST AND EVALUATE THE FEASIBILITY OF THIS CONCEPT AND TO PREPARE THE PRELIMINARY DESIGN SPECIFICATION OF COMPLETE INTERACTIVE NECK MOUNTED ON A STATE-OF-THE-ART TEST MANIKIN.

TRANSITIONS RESEARCH CORP

DARPA

\$ 49,907

15 DURANT AVE  
BETHEL, CT 06801  
JOHN M EVANS

TITLE:

LOW COST MOBILE ROBOT

T 14

OFFICE: DARPA

RESEARCH WORK ON INTELLIGENT MOBILE MACHINES IS HINDERED BY THE LACK OF MOBILE ROBOT BASES SUITABLE FOR RESEARCH AND EDUCATION. TRC WILL WORK WITH DARPA AND DARPA RESEARCHERS TO DEVELOP REQUIREMENTS, ANALYZE AND SELECT THE DRIVE SYSTEM, AND DESIGN THE CONTROL AND COMMUNICATIONS SUBSYSTEMS. DRIVE OPTIONS TO BE ANALYZED INCLUDE A VARIETY OF WHEELED, TRACKED, AND OTHER MOBILITY SYSTEMS. COMPUTER CONTROL SYSTEMS WILL BE CONSIDERED WHICH PROVIDE ADQUATE ON-BOARD COMPUTING POWER FOR REAL TIME FUNCTIONS WITH AN OPEN ARCHITECTURE IN WHICH HARDWARE AND SOFTWARE INTERFACES ARE AVAILABLE TO THE RESEARCHER AT ANY LEVEL FROM THE MOTOR CURRENTS ON UP. COMMUNICATIONS OPTIONS ANALYSIS WILL INCLUDE BOTH MICROWAVE AND LASER DIODE OPTICAL LINKS FOR BOTH CONTROL AND VISION AND OTHER SENSOR LINKS. THE RESULT OF THIS WORK WILL BE A REPORT IDENTIFYING REQUIREMENTS, ANALYZING OPTIONS AND SYSTEM INTEGRATION ISSUES, AND DOCUMENTING THE PRELIMINARY DESIGN OF A VEHICLE MEETING THE REQUIREMENTS. A MOCK UP OF THE RECOMMENDED VEHICLE DESIGN WILL ALSO BE PROVIDED. PHASE II WOULD TAKE THIS DESIGN TO THE POINT OF MANUFACTURING.

TRI-TECH INC

NAVY

\$ 42,041

4514 OLD COLUMBIA PIKE  
ANNANDALE, VA 22003  
J P MARLOWE

TITLE:

SOLID STATE RADAR TRANSMITTER AMPLIFIER MODULES STUDY

T 41

OFFICE: SPAWAR

THE STUDY DEFINES A FIVE YEAR DEVELOPMENT PLAN FOR S-BAND SOLID

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
<p>STATE RADAR TRANSMITTER MODULES. COMPARISONS ARE MADE OF EXISTING AND PLANNED RADAR SETS IN ORDER TO DETERMINE REQUIRED CHARACTERISTICS OF COMMON SETS OF MODULES. AREAS THAT REQUIRE FURTHER DEVELOPMENT ARE DESCRIBED, AND ARE THE BASIS FOR THE FIVE YEAR DEVELOPMENT PLAN.</p>		

TRI-TECH INC 4514 OLD COLUMBIA PIKE ANNANDALE, VA 22003 DAVID P ALLEN TITLE: AEROSTAT BLIMP RPV AIRBORNE EARLY WARNING FOR THE USMC T 26 OFFICE: USMC/LBC	NAVY	\$ 38,076
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THE EXCLUSIVE USE OF GROUND BASED RADAR FOR AIR SURVEILLANCE IS RESTRICTIVE IN THAT LOW FLYING AIRCRAFT CANNOT BE DETECTED WHILE THEY ARE MASKED BY TERRAIN FEATURES, OR BELOW RADAR LINE-OF-SIGHT. A POTENTIAL SOLUTION IS AN AIRBORNE RADAR SYSTEM WITH A LOOK-DOWN CAPABILITY WORKING IN CONJUNCTION WITH GROUND BASED RADARS. THIS STUDY COMPARES THE AIRBORNE EARLY WARNING POTENTIAL OF AEROSTATS, BLIMPS, AND REMOTELY PILOTED VEHICLELS. EACH PLATFORM WILL BE ANALYZED FROM THE STANDPOINT OF: CAPABILITY, COST, FEASIBILITY, MNPOWER, RISK, LOGISTICS AND AFFORDABILITY.

TRIANGLE RESEARCH AND DEVEL. CORP. P.O. BOX 12696 RESEARCH TRI. PK, NC 27709 DAVID P. COLVIN, PHD TITLE: ENHANCED HEAT TRANSFER AND STORAGE MATERIALS FOR STRATEGIC DEFENSE SYSTEMS T 4 OFFICE:	SDIO	\$ 49,898
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AN INVESTIGATION IS PROPOSED FOR THE IMPROVEMENT OF SPACECRAFT THERMAL MANAGEMENT BY DEVELOPMENT OF MATERIALS AND SYSTEMS WITH SIGNIFICANTLY ENHANCED HEAT TRANSFER AND STORAGE PROPERTIES. MICRO-ENCAPSULATED PHASE CHANGE MATERIALS (PCMS) CONSISTING OF LIQUID SLURRIES AND A PACKED-BED THERMAL STORAGE MODULE WOULD BE UTILIZED. INVESTIGATIONS FOR NASA AND USAF HAVE INDICATED A REVOLUTIONARY IMPROVEMENT IN HEAT TRANSFERRED AND STORED AS WELL AS LARGE REDUCTIONS IN PUMPING POWER. THE PROPOSED PHASE I SDIO SBIR EFFORT WOULD

FISCAL YEAR 1986

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INCLUDE HIGH TEMPERATURE PCM MATERIALS INVESTIGATION AND DEVELOPMENT,  
TEST BED DESIGN AND FABRICATION, SYSTEMS TEST AND ANALYSIS, AND A  
FINAL REPORT.

TRIBOLOGY CONSULTANTS INC

AF

\$ 48,000

504 FOXWOOD LN

PAOLI, PA 19301

LEWIS B SIBLEY

TITLE:

SOLID LUBRICATED BALL/CAGE CONTACT SIMULATION

T 187

OFFICE: AFWAL/PO

A SPECIAL TEST FIXTURE WILL BE DEVELOPED FOR AN EXISTING TEST MACHINE RECENTLY ADAPTED FOR TESTING STEEL BALLS BETWEEN TWO ROLLING DISKS. USING THIS FIXTURE, A TEST TECHNIQUE WILL BE DEVELOPED IN PHASE I TO MEASURE THE FRICTION, TRANSFER FILM RATE, CAGE WEAR RATE, AND BALL/RACE TRACK SURFACE DAMAGE AND WEAR WITH SEVERAL CANDIDATE SOLID LUBRICANT MATERIALS AND BOTH STEEL AND CERAMIC BALLS. THESE MEASUREMENTS WILL BE COORDINATED WITH COMPUTER STUDIES OF BALL/CAGE INTERACTIONS IN MAINSHAFT GAS TURBINE ANGULAR CONTACT BALL BEARINGS FOR REFINEMENT OF BOTH THE ANALYSIS AND THE MEASUREMENT TECHNIQUES. THEN IN PHASE II WE WOULD MODIFY THE TEST RIG TO OPERATE AT HIGH SPEED AND TEMPERATURE. DESIGN CRITERIA WOULD THEN BE DEVELOPED FOR A FAMILY OF SOLID LUBRICATED BEARINGS WHICH WE WOULD PLAN TO MARKET IN CONJUNCTION WITH OUR NEW BUSINESS ON CERAMIC BEARINGS.

TRIPLE VISION

AF

\$ 50,204

1238 COMO BLVD E

ST PAUL, MN 55117

RICHARD A FUNDAKOWSKI

TITLE:

CLASSIFIER DESIGN AID FOR THE RECOGNITION OF THREE DIMENSIONAL  
OBJECTS

T 112

OFFICE: AFWAL/AA

THE OBJECTIVE OF THE PROPOSED RESEARCH IS THE FEASIBILITY ASSESSMENT OF AN INTEGRATED SUPPORT ENVIRONMENT FOR THE COMPUTER-AIDED DESIGN, ANALYSIS AND EVALUATION OF IMAGE UNDERSTANDING ALGORITHMS FOR THE RECOGNITION OF MAN-MADE OBJECTS FROM IR OR SIMILAR ELECTRO-OPTICAL SENSORS. IF SUCCESSFUL, THIS RESEARCH WILL PROVIDE A BASIS

FISCAL YEAR 1986

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FOR THE DEVELOPMENT OF A SEMI-AUTOMATED SYSTEM BY WHICH 3-D DESCRIPTIONS OF MAN-MADE TARGETS WILL BE ANALYZED FOR DETERMINATION OF THE MOST EFFICIENT AND RELIABLE MEANS OF RECOGNIZING THE TARGETS IN A FIELD ENVIRONMENT. THE PROPOSED EFFORT WILL FIRST INVESTIGATE 3-D METHODS OF PREDICTING THE INFRARED SIGNATURE OF TARGETS UNDER REPRESENTATIVE VIEWING CONDITIONS. THEN THE PREDICTED SIGNATURES AND ITS VARIABILITY WILL BE STUDIED TO DEVELOP METHODS TO GAUGE THE DISCRIMINABILITY AMONG SEVERAL TARGETS BASED ON THE PHYSICAL CHARACTERISTICS OF THE TARGET, INFRARED RADIATION PHENOMENA, THE SENSOR CHARACTERISTICS, AND IMAGING CONDITIONS.

TRIPLE VISION 2887 N PASCAL ROSEVILLE, MN 55113 ROBERT C FITCH TITLE: AN EXPERT DESIGN AID FOR EMBEDDED ELECTRONIC SYSTEMS T 115 OFFICE: AFWAL/AA	AF	\$ 49,294
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RECENT VLSI ADVANCES IN THE DOD VHSIC PROGRAM HAVE RESULTED IN THE DEVELOPMENT OF MODULAR MULTIPROCESSOR ARCHITECTURES WHICH CAN BE "MIXED AND MATCHED" TO DESIGN EMBEDDED MILITARY ELECTRONIC SYSTEMS FOR NUMEROUS APPLICATIONS. TO DESIGN WITH THESE MODULES, IT IS NECESSARY TO DO EXTENSIVE TRADEOFF ANALYSES REQUIRING THE DESIGNER TO BE AN EXPERT ON THE DESIGN PROCESS AS WELL AS THE AVAILABLE MODULES AND ARCHITECTURES. BECAUSE THIS PROCESS IS CURRENTLY DONE MANUALLY, IT IS NOT POSSIBLE FOR THESE TRADEOFFS TO BE DONE IN A TIMELY AND COST EFFECTIVE MANNER, RESULTING IN NON-OPTIMAL DESIGNS. THE PURPOSE OF OUR PHASE I RESEARCH IS TO DETERMINE THE FEASIBILITY OF DEVELOPING AN EXPERT DESIGN AID WHICH HAS KNOWLEDGE OF BOTH THE DESIGN PROCESS AND THE MODULAR ARCHITECTURES. THIS WILL BE ACCOMPLISHED THROUGH THE DEFINITION OF THE KEY COMPONENTS OF THE EXPERT SYSTEMS KNOWLEDGE BASE BY (1) DEFINING A HIERARCHICAL METHOD FOR INPUTTING THE EMBEDDED ELECTRONIC SYSTEM REQUIREMENTS, (2) REVIEWING AND CLASSIFYING MODULAR ARCHITECTURES, AND (3) DEFINING THE RULES AND INFERENCE STRUCTURES REQUIRED TO PERFORM ARCHITECTURAL TRADEOFFS. THIS KNOWLEDGE BASE DEFINITION WILL ESTABLISH THE FRAMEWORK ON WHICH TO DEVELOP THE EXPERT SYSTEM IN PHASE II.

TSI INC PO BOX 64394 ST PAUL, MN 55164 JUGAL AGARWAL TITLE: LDV SEEDER DEVELOPMENT T 293 OFFICE: AEDC/DOT	AF	\$ 49,690
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A PARTICLE GENERATOR CAPABLE OF GENERATING MONODISPERSE AEROSOL

FISCAL YEAR 1986

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AROUND 0.1 MICROMETER WILL BE DEVELOPED. NUMBER OF PARTICLES GENERATED WILL EXCEED 10 TO THE 12 POWER PARTICLES PER SECOND. THE PRINCIPLE TO BE EXPLORED IS FLUID ENERGY GRINDING PRINCIPLE, COMMONLY USED TO GRIND BULK SOLIDS IN CHEMICAL INDUSTRY. THE PROJECT WILL INCLUDE AERODYNAMIC PARTICLE SIZE MEASUREMENT USING AERODYNAMIC PARTICLE SIZER AND DIFFERENTIAL MOBILITY PARTICLE SIZER. THE PRIMARY APPLICATION OF THE PARTICLE GENERATOR WILL BE IN LASER DOPPLER VELOCIMETRY.

TSI INC PO BOX 64394 ST PAUL, MN 55164 JUGAL AGARWAL TITLE: SMALL DROPLET GENERATOR T 181 OFFICE: TECOM/DPG	ARMY	\$ 48,390
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A DROPLET GENERATOR CAPABLE OF PRODUCING DROPLETS IN THE SIZE RANGE OF 10 TO 400 MICROMETERS WILL BE DEVELOPED. THIS DROPLET GENERATOR OPERATES ON THE PRINCIPLE OF LIQUID JET BREAK-UP BY MECHANICAL VIBRATION. WITH THIS TYPE OF GENERATOR, THE OPERATING PARAMETERS CAN UNIQUELY DEFINE THE DROPLET SIZE. THE GENERATOR IS MADE ADAPTABLE TO HIGH VISCOSITY LIQUIDS BY SELECTION OF VIBRATION AMPLITUDES AND NOZZLE SIZES AND COATINGS. TECHNIQUES FOR DILUTING THE LIQUID THEN DRYING THE DROPLETS WILL ALSO BE RESEARCHED TO EXTEND THE VISCOSITY RANGE. THE SIZE OF THE DROPLETS IS VERIFIED BY A TWO BEAM LIGHT EXTINCTION TECHNIQUES. AS A DROPLET PASSES THROUGH TWO THIN LIGHT BEAMS, THE WIDTH OF EACH EXTINCTION PULSE IS A FUNCTION OF DROPLET SIZE AND DROPLET VELOCITY ONLY, HENCE THE RATIO OF THE TWO IS A UNIQUE FUNCTION OF DROPLET SIZE.

TSI INC PO BOX 64394 ST PAUL, MN 55164 RICHARD REMIARZ TITLE: EQUIPMENT TO GENERATE AND MEASURE SMOKE DEVELOPMENT T 182 OFFICE: NSRDC	NAVY	\$ 49,499
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IN ORDER TO EVALUATE AND IMPROVE SYSTEMS AND PROCEDURES FOR SMOKE



FISCAL YEAR 1986

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CONTROL ABOARD SHIP, SAFE AND EFFECTIVE TECHNIQUES AND EQUIPMENT FOR CONDUCTING SMOKE MOVEMENT TESTS ARE NEEDED. THIS CAN BE DONE BY DEVELOPING A SMOKE GENERATOR AND SMOKE MEASURING INSTRUMENT. THE SMOKE GENERATOR WILL BE A HOT FLUID SMOKE GENERATOR, USING A NEW SMOKE FLUID NOW AVAILABLE. THE SMOKE DETECTOR WILL BE A PORTABLE, SOLID STATE PHOTOMETER. DURING PHASE I, THE OVERALL DESIGNS AND OPERATING PARAMETERS WILL BE ESTABLISHED, WITH BREAD-BOARD VERSIONS BUILT AND TESTED.

TTL TECHNIQUES 65 LIMEKILN PIKE GLENSIDE, PA 19038 GAYLORD EVEY TITLE: ADVANCED PACKAGING ASSEMBLY FOR VLSI DEVICES T 149 OFFICE: NWSC	NAVY	\$ 49,500
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PRESENTLY THERE ARE MANY PROBLEMS WITH THE AVAILABLE IN THE MARKET. THIS RESEARCH PROJECT PROPOSES A VLSI PACKAGING SYSTEM WHICH CAN PROVIDE ENHANCED THERMAL MANAGEMENT BECAUSE OF THE USE OF SPUTTERED ALUMINUM NITRIDE, COPPER CLAD INVAR CORE MATERIAL IN THE SUBSTRATE AND TAB TECHNOLOGY. THE PACKAGING SYSTEM ALSO ENHANCES THE ELECTRICAL CHARACTERISTICS OF THE VLSI DEVICES BECAUSE OF AN INTEGRATED DECOUPLING CAPACITOR AND TAB BONDING. OTHER ADVANTAGES OF THE SYSTEM ARE COST REDUCTION, HIGH RELIABILITY AND GREATER STRUCTURAL STRENGTH. FIVE EMERGING TECHNOLOGIES ARE USED IN THE SYSTEM: COPPER CLAD INVAR CORE MATERIAL, TAB BONDING, SPUTTERED ALUMINUM NITRIDE, GLASS BEADED KOVAR AND THIN FILM HERMETIC SEALING. THE RESEARCH PLAN CALLS FOR DESIGN, DEVELOP, PROTOTYPE TESTING, EVALUATION AND ASSESSMENT OF THE SYSTEM. THE TEST PLAN USES BOTH MIL SPEC AND SPECIAL TESTING.

UBC. INC. 6089 JOHNS RD. TAMPA, FL 33614 PATRICK E. CRANE TITLE: RF HOLOGRAPHY INVESTIGATION FOR SPACE BASED DEFENSE SYSTEM SURVIVABILITY ENHANCEMENT T 7 OFFICE:	SDIO	\$ 49,227
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UBC, INCORPORATED, AN ENGINEERING FIRM PERFORMING RESEARCH, DEVELOP-

FISCAL YEAR 1986

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MENT, AND CONSULTING IN ADVANCED TECHNOLOGY ELECTROMAGNETICS THROUGH 140 GHz, PROPOSES AN SBIR PROGRAM TO INVESTIGATE RADIO FREQUENCY (RF) HOLOGRAPHY IN THE CONTEXT OF ENHANCING THE SURVIVABILITY OF STRATEGIC DEFENSE SYSTEMS, AND TO DEFINE SUITABLE IMPLEMENTATIONS THEREOF. APPLICATION OF RF HOLOGRAPHIC TECHNIQUES TO SATELLITE DEFENSE, FOR EXAMPLE, WOULD MINIMIZE THE PROBABILITY OF THEIR DETECTION AND SUBSEQUENT TRACKING BY HOSTILE RADARS. A HOLOGRAPHIC (3 DIMENSIONAL) IMAGE OF THE SATELLITE, PROPERLY RECONSTRUCTED BY AN ACTIVE RADAR ON-BOARD THE SATELLITE OR CLUSTER OF SATELLITES SHOULD PROVIDE ACTIVE CANCELLATION/DECEPTION OF HIGH RESOLUTION MICROWAVE/MILLIMETER WAVE INTERROGATING SENSORS. THE SATELLITE IMAGE CAN BE HELD IN A FIXED POSITION, SPATIALLY DITHERED, OR SHIFTED IN ANY DIRECTION WITH RESPECT TO THE SATELLITE ITSELF AT ANY DESIRED VELOCITY. THE RECONSTRUCTION FIELD MAY HAVE A FREQUENCY DISTINCT FROM THE ORIGINAL INTERROGATING INCIDENT FIELD. MODIFIED HOLOGRAMS CAN LIKELY BE MATHEMATICALLY SYNTHESIZED BASED UPON ONE OR MORE MEASURED BASELINE SATELLITE HOLOGRAMS.

UFA INC	AF	\$ 47,258
710 COMMONWEALTH AVE		
NEWTON, MA 02159		
DR ARTHUR GERSTENFELD		
TITLE:		
EXPERT SYSTEM MANAGEMENT SYSTEM (ESMS)		
T 116	OFFICE: AFWAL/AA	

THE PURPOSE OF THIS PROJECT IS TO SHOW THE FEASIBILITY OF DEVELOPING AN EXPERT SYSTEM MANAGEMENT SYSTEM (ESMS). THE ESMS WOULD INTERFACE WITH THE PILOT ON ONE SIDE AND INTERFACE WITH THE OTHER EXPERT SYSTEMS ON THE OTHER SIDE. IN ORDER TO DEMONSTRATE THE FEASIBILITY OF THE SYSTEM WE HAVE DIVIDED THE PROJECT INTO THREE OBJECTIVES TO BE PERFORMED CONSECUTIVELY. THE FIRST OBJECTIVE IS TO DEFINE THE PROBLEM. IN ORDER TO DO THIS WE WILL CONSTRUCT THREE SMALL EXPERT SYSTEMS ON PC'S - ONE FOR ENGINE DIAGNOSIS, ONE FOR ROUTE PLANNING, AND ONE FOR MONITORING. OUR SECOND OBJECTIVE IS TO DEVELOP A CONCEPTUALIZATION MODEL OF THE EXPERT SYSTEM MANAGEMENT SYSTEM. THIS WILL BE BASED ON SQUADRON PILOT INPUT, PLUS INPUTS FROM THE OTHER EXPERT SYSTEMS. OUR THIRD AND FINAL OBJECTIVE IS TO CONSTRUCT A PRELIMINARY EXPERT SYSTEM MANAGEMENT SYSTEM (ABOUT A 20-RULE-BASED SYSTEM) TO SHOW FEASIBILITY.

FISCAL YEAR 1986

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UFA INC 710 COMMONWEALTH AVE NEWTON, MA 02159 ARTHUR GERSTENFELD TITLE: INTELLIGENT TUTORING ASSISTANT (ITA) T 112 OFFICE: MICOM	ARMY	\$ 49,400

THE PROJECT CONSISTS OF THREE OBJECTIVES TO BE PERFORMED IN SEQUENCE DURING THE SIX MONTHS OF PHASE I. THE FIRST OBJECTIVE IS TO IDENTIFY (AND ANALYZE) TWENTY VARIED CURRENT HIGH TECHNOLOGY WEAPON SYSTEMS WHERE AT PRESENT HUMAN TUTORS ARE EMPHASIZING SKILL LEVEL DEFICIENCIES. THE SECOND OBJECTIVE WILL BE TO SELECT 6 CASES FOR INTELLIGENT COMPUTER ASSISTED INSTRUCTION (ICAI) FROM THE ORIGINAL SAMPLE OF 20. WE WOULD EMPHASIZE CASES WHERE A STUDENT COULD INTERACT IN A NATURAL LANGUAGE (I.E. ENGLISH). THE THIRD OBJECTIVE IS TO PROVIDE A DESCRIPTION AND COSTS FOR A SET OF 3 OPTIONS (WHICH WE WILL ALSO RANK) SO THAT PHASE II CAN PROCEED QUICKLY TO PROTOTYPE BASED ON THE OUTPUT FROM PHASE I. THE OUTPUT FOR PHASE I WILL BE DETAILED DEVELOPMENT PLAN WITH EXAMPLES FOR EACH OF THE THREE RANKED OPTIONS AND PRELIMINARY PROTOTYPES.

ULTRAMET 12173 MONTAGUE ST. PACOIMA, CA 91331 H. O. PIERSON TITLE: THORIA COATING FOR OXIDATION PROTECTION OF GRAPHITE COMPOSITES AND OTHER STRUCTURAL MATERIALS TO 4000F T 11 OFFICE:	SDIO	\$ 49,992
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THE REQUIREMENTS OF HIGH STRENGTH AT HIGH TEMPERATURES WITH LIGHT WEIGHT AND RELIABLE RESISTANCE TO HIGH TEMPERATURE OXIDIZER ATTACK LIMITS MATERIAL CHOICES TO CARBON COMPOSITES, METAL MATRIX COMPOSITES AND CERAMIC COMPOSITES. ALTHOUGH CERAMIC COMPOSITES ARE INHERENTLY OXIDATION RESISTANT, THE REQUIRED STRENGTH AND RELIABILITY ARE CURRENTLY BEYOND THE STATE-OF-THE-ART. METAL MATRIX COMPOSITES DO NOT HAVE THE REQUIRED HIGH TEMPERATURE CHARACTERISTICS UNLESS REFRACTORY METALS ARE USED. BOTH REFRACTORY METAL COMPOSITES AND CARBON COMPOSITES REQUIRE EXTERNAL OXIDATION PROTECTION. SILICON BASED MATERIALS ARE CURRENTLY USED TO PROTECT THESE MATERIALS FROM OXIDATION

FISCAL YEAR 1986

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BUT FOR A VARIETY OF REASONS, THEIR PROTECTION IS LIMITED TO 2500F. AN OVERCOATING OF A REFRACTORY METAL OXIDE SUCH AS ZIRCONIA, HAFNIA OR THORIA COULD EXTEND THE PROTECTIVE LIMIT TO NEAR THE MELTING TEMPERATURE OF THE SILICON COMPOUND, 4900F FOR SILICON CARBIDE. ULTRAMET HAS ALREADY DEMONSTRATED THAT AN OVERCOAT OF HAFNIA CAN EXTEND THIS PROTECTION TEMPERATURE TO AT LEAST 3400F. IN THIS CASE THE TEMPERATURE WAS LIMITED BY THE PHASE AND VOLUMETRIC CHANGE WHICH RESULTS IN CRACKING AND SPALLING WHEN HAFNIA GOES THROUGH ITS TRANSITION TEMPERATURE. ZIRCONIA EXHIBITS A SIMILAR BEHAVIOR BUT THORIA DOES NOT. TO OUR KNOWLEDGE, THORIA HAS NEVER BEEN SUCCESSFULLY DEPOSITED BY CHEMICAL VAPOR DEPOSITION (CVD). BY THE APPLICATION OF INNOVATION AND 150 MAN-YEARS OF CVD EXPERIENCE, ULTRAMET PROPOSES TO ANALYTICALLY AND EXPERIMENTALLY DETERMINE THE FEASIBILITY OF DEPOSITING DENSE, CONTINUOUS FILMS OF THORIA.

ULTRAMET	SDIO	\$ 49,994
12173 MONTAGUE ST.		
PACOIMA, CA 91331		
ROBERT A. HOLZL		
TITLE:		
OXIDATION PROTECTION OF CARBON COMPOSITES TO 3500F AND HIGHER		
T 11 OFFICE:		

A REAL NEED EXISTS IN BOTH THE MILITARY AND COMMERCIAL ARENAS FOR A RELIABLE OXIDATION PROTECTIVE MATERIAL FOR CARBON COMPOSITES TO 3500F. LEADING RESEARCHERS HAVE PREDICTED THAT A MIXTURE OF SiC AND HfC OR ZrC SHOULD BE GOOD CANDIDATE MATERIAL. BUT THEIR EXPERIMENTAL EFFORTS HAVE PRODUCED MIXED RESULTS; BOTH GOOD AND BAD AND NON-REPEATABLE. NO SATISFACTORY EXPLANATION WAS ACHIEVED. THE TECHNICAL STAFF AT ULTRAMET AGREES THAT THE SiC/HfC (OR ZrC) SYSTEM SHOULD HAVE A HIGH PROBABILITY OF SUCCESS. IN ANALYZING THE PREVIOUS RESULTS, WE FEEL THAT THE LIKELY EXPLANATION FOR THE PAST FAILURE AND NON-REPEATABILITY WAS OVERLOOKED. IN THIS EFFORT ULTRAMET PROPOSES TO INVESTIGATE ITS THEORY (DESCRIBED WITHIN) AND DEMONSTRATE THAT A SiC/HfC (OR ZrC) MIXTURE CAN BE DEPOSITED BY CVD TO PRODUCE RELIABLE, OXIDATION RESISTANT COATINGS TO 3500F. DUE TO THE UNIQUE AND UNPARALLELED TECHNICAL STAFF ASSEMBLED AT ULTRAMET, WE FEEL THAT THIS PROGRAM HAS A HIGH PROBABILITY OF SUCCESS.

ULTRAMET	NAVY	\$ 49,962
12173 MONTAGUE ST		
PACOIMA, CA 91331		
HUGH O PIERSON		
TITLE:		
STABILIZED HIGH TEMPERATURE OXIDES BY CVD		
T 153 OFFICE: NAVAIR/NADC		

ZIRCONIA (ZrO(2) AND HAFNIA HfO(2)) HAVE BEEN IDENTIFIED AS MAJOR

FISCAL YEAR 1986

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ELEMENTS IN THE DEVELOPMENT OF COMPONENTS WHICH CAN OPERATE AT ULTRA HIGH TEMPERATURES (3000 - 4000F AND ABOVE). BOTH MATERIALS ARE VERY REFRACTORY (MELTING TEMPERATURE ABOVE 4800F), STABLE COMPOUNDS, THAT HAVE HIGH CHEMICAL INERTNESS AND LOW VAPOR PRESSURE AT HIGH TEMPERATURE. BOTH HAVE LONG BEEN USED IN BULK FORM AS OXIDATION RESISTANT MATERIALS ABOVE 1800C (3272F). FOR CARBON AND OTHER COMPOSITE MATERIALS TO OPERATE AT 3000-4000F AND ABOVE A METHOD OF VAPOR DEPOSITING THESE MATERIALS, AS SURFACE COATINGS OR INFILTRANTS, WILL BE REQUIRED.  $HfO_2$  AND  $ZrO_2$  CAN BE DEPOSITED BY CHEMICAL VAPOR DEPOSITION (CVD) BUT THE DEPOSITED MATERIALS SUFFER FROM THE SAME FLAW AS THE BULK MATERIALS: A MARKED PHASE CHANGE ACCOMPANIED BY A VOLUME CHANGE AT TEMPERATURES (TRANSITION TEMPERATURE) 1000-2000C BELOW THE MELTING TEMPERATURE. THIS TYPICALLY RESULTS IN CREAKING AND SPALLING. IN HOT PRESSED MATERIALS THIS PHASE CHANGE CAN BE VIRTUALLY ELIMINATED BY THE ADDITION OF A STABILIZER. TESTS AT ULTRAMET HAVE SHOWN CONCLUSIVELY THAT THESE MATERIALS DEPOSITED BY CVD WILL NEVER OPERATE TO THEIR FULL POTENTIAL ABOVE THE TRANSITION TEMPERATURE UNLESS A MEANS IS DEVELOPED TO INHIBIT THIS PHASE CHANGE. BY AN INNOVATIVE APPLICATION OF CVD ULTRAMET PROPOSE TO DEMONSTRATE THE FEASIBILITY OF STABILIZING CVD  $HfO_2$  AND/OR  $ZrO_2$ .

ULTRAMET 12173 MONTAGUE ST PACOIMA, CA 91331 ROBERT A HOLZL TITLE: HEAVY METAL LETHALITY IMPROVEMENT T 27 OFFICE: AFATL/MNW	AF	\$ 49,960
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TUNGSTEN IS AN IMPORTANT MATERIAL FOR A WIDE VARIETY OF ORDNANCE ITEMS. PRESENT COMMERCIALY AVAILABLE TUNGSTEN AND TUNGSTEN ALLOYS ARE BRITTLE WHICH LIMITS THE USEFULNESS OF THIS MATERIAL. IF DUCTILE TUNGSTEN WERE AVAILABLE THE EFFECTIVENESS OF ORDNANCE ITEMS SUCH AS EXPLOSIVELY FORMED PENETRATORS, SHAPED CHARGE LINERS AND FRAGMENTING MUNITION BODIES COULD BE GREATLY INCREASED. ULTRAMET PROPOSES TO INVESTIGATE THE FEASIBILITY OF A UNIQUE DOUBLE PURIFICATION METHOD TO PRODUCE DUCTILE TUNGSTEN WHICH CAN ALSO PRODUCE A COST EFFECTIVE PRODUCT.

ULTRAMET 12173 MONTAGUE ST PACOIMA, CA 91331 DR JOHN T HARDING TITLE: COATED TUNGSTEN POWDER T 129 OFFICE: LABCOM/MTL	ARMY	\$ 49,951
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KINETIC ENERGY WEAPONS EMPLOY TUNGSTEN PROJECTILES. FOR MAXIMUM

FISCAL YEAR 1986

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EFFECTIVENESS THE TUNGSTEN MUST POSSES HIGH DENSITY, STRENGTH AND DUCTILITY. LIQUID PHASE SINTERING OF TUNGSTEN POWDER IN A MATRIX OF IRON AND NICKEL POWDER HAS BEEN EMPLOYED FOR THIS PURPOSE. PROBLEMS STILL EXIST. AS DENSITY APPROACHES THEORETICAL, BOTH DUCTILITY AND TENSILE STRENGTH ARE SACRIFICED. THE REASON SEEMS TO BE THAT AS THE MATRIX COMPONENT APPROACHES ZERO, A HIGH DEGREE OF CONTINGUITY OCCURS BETWEEN GRAINS, NON-UNIFORMITY OF THE MATRIX DEVELOPS DUE TO FLUCTUATIONS, AND DELETERIOUS IMPURITIES LIKE O(2), S AND P SEGREGATE ON GRAIN BOUNDARIES. WE PROPOSE TO MINIMIZE THESE ADVERSE EFFECTS BY COATING THE TUNGSTEN POWDER WITH THE MATRIX CONSTITUENTS Fe AND Ni BY MEANS OF CHEMICAL VAPOR DEPOSITION (CVD). THE EXTREME PURITY LEVELS AND UNIFORMITY OF DISTRIBUTION ATTAINABLE BY CVD CAN ALLEVIATE ALL THREE DELETRIOUS EFFECTS. THE INNOVATIVE PROCESS HEREIN DESCRIBED WILL ALSO PERMIT GRAIN SIZE CONTROL.

ULTRAMET	DNA	\$ 49,951
12173 MONTAGUE ST		
PACOIMA, CA 91331		
DR ROBERT H TUFFIAS		
TITLE:		
HEL AND PROJECTILE PROTECTION		
T 4 OFFICE: AM/SBIR		

CHEMICAL VAPOR DEPOSITION (CVD) IS A UNIQUE TECHNOLOGY FOR FABRICATING MATERIALS WHICH CAN PROVIDE EXTERNAL PROTECTION FROM LASER AND OTHER DIRECTED ENERGY SOURCES AS WELL AS KINETIC ENERGY HARDENING AND NUCLEAR RADIATION PROTECTION FOR ELECTRONICS. IT HAS ALREADY BEEN DEMONSTRATED THAT ULTRAMET'S A200 COATING, FABRICATED BY CVD, IS THE 'HARDEST' MATERIAL TESTED TO DATE UNDER LASER RADIATION. IN THIS PROGRAM ULTRAMET PROPOSES TO DEMONSTRATE THE FEASIBILITY OF LOADING A LOW DENSITY CARBON FOAM MATERIAL WITH BORON CARBIDE (B[4]C) OR TITANIUM DIBORID (TiB[2]) TO PROVIDE PROTECTION AGAINST KINETIC ENERGY WEAPONS. THE INCIDENT SURFACE WILL ALSO BE COATED WITH A HIGHLY REFLECTIVE MATERIAL, A200, AND EVALUATION WILL BE PERFORMED UNDER LASER RADIATION.

ULTRAMET	DNA	\$ 49,904
12173 MONTAGUE ST		
PACOIMA, CA 91331		
RICHARD B KAPLAN		
TITLE:		
EXTERNAL ARMOR/THERMAL BARRIER FOR HEL THREATS		
T 4 OFFICE: AM/SBIR		

CHEMICAL VAPOR DEPOSITION (CVD) IS A UNIQUE TECHNOLOGY FOR FABRI-

FISCAL YEAR 1986

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CATING MATERIALS WHICH CAN PROVIDE EXTERNAL PROTECTION FROM LASER AND OTHER DIRECTED ENERGY SOURCES AS WELL AS KINETIC ENERGY HARDENING AND NUCLEAR RADIATION PROTECTION FOR ELECTRONICS. IT HAS ALREADY BEEN DEMONSTRATED THAT ULTRAMET'S A200 COATING FABRICATED BY CVD IS THE 'HARDEST' MATERIAL TESTED TO DATE UNDER LASER RADIATION. IN THIS PROGRAM ULTRAMET PROPOSES TO DEMONSTRATE THE FEASIBILITY OF LOADING A LOW DENSITY CARBON FELT MATERIAL WITH A CONCENTRATION GRADIENT OF A REFRACTORY METAL CARBIDE (WC) TO PROVIDE ENERGY ABSORBING MATERIAL AT THE ENERGY INCIDENT SURFACE WHILE MINIMIZING THE THERMAL CONDUCTIVITY TO THE BACK (MILLILE ATTACHMENT) SURFACE. THE INCIDENT SURFACE WILL ALSO BE COATED WITH A HIGHLY REFLECTIVE MATERIAL, A200 AND EVALUATION WILL BE PERFORMED UNDER LASER RADIATION.

ULTRAMET	DNA	\$ 49,966
12173 MONTAGUE ST		
PACOIMA, CA 91331		
ROBERT H TUFFIAS		
TITLE:		
REFLECTIVE COATINGS FOR HEL ARMOR		
T 4	OFFICE: AM/SBIR	

CHEMICAL VAPOR DEPOSITION (CVD) IS A UNIQUE TECHNOLOGY FOR FABRICATING MATERIALS WHICH CAN PROVIDE EXTERNAL PROTECTION FROM LASER AND OTHER DIRECTED ENERGY SOURCES AS WELL AS KINETIC ENERGY HARDENING AND NUCLEAR RADIATION PROTECTION FOR ELECTRONICS. IT HAS ALREADY BEEN DEMONSTRATED THAT ULTRAMET'S A200 COATING FABRICATED BY CVD IS THE 'HARDEST' MATERIAL TESTED TO DATE UNDER LASER RADIATION. IN THIS PROGRAM ULTRAMET PROPOSES TO DEVELOP AN EXTENSIVE COATING MATERIAL-LASER INTERACTION DATA BASE. TEST RESULTS WILL PROVIDE INSIGHT INTO THE EFFECTIVENESS OF PROTECTIVE COATINGS AND A BETTER UNDERSTANDING OF THE REQUIRED CHARACTERISTICS OF SUCH MATERIALS. PHASE II WILL PERMIT OPTIMIZATION OF THE CVD PROCESS, COATINGS, AND SUBSTRATE MATERIALS, AND PERMIT MATERIALS WITH TAILORED CHARACTERISTICS AND TAILORED SHAPES TO BE FABRICATED.

ULTRAMET	DNA	\$ 49,939
12173 MONTAGUE ST		
PACOIMA, CA 91331		
RICHARD B KAPLAN		
TITLE:		
GRADED -Z MATERIALS FOR PROTECTION AGAINST HEL'S AND NUCLEAR THREATS		
T 5	OFFICE: AM/SBIR	

CHEMICAL VAPOR DEPOSITION (CVD) IS A UNIQUE TECHNOLOGY FOR

FISCAL YEAR 1986

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FABRICATING MATERIALS WHICH CAN PROVIDE EXTERNAL PROTECTION FROM LASER AND OTHER DIRECTED ENERGY SOURCES AS WELL AS KINETIC ENERGY HARDENING AND NUCLEAR RADIATION PROTECTION FOR ELECTRONICS. IT HAS ALREADY BEEN DEMONSTRATED THAT ULTRAMET'S A200 COATING FABRICATED BY CVD IS THE "HARDES" MATERIAL TESTED TO DATE UNDER LASER RADIATION. IN THIS PROGRAM ULTRAMET PROPOSES TO DEMONSTRATE THE FEASIBILITY OF FABRICATING GRADED-Z MATERIALS WHICH WILL PROVIDE NUCLEAR RADIATION HARDENING AND COAT THEM WITH A200 FOR LASER PROTECTION. LASER TESTING WILL DEMONSTRATE THE EFFICACY OF THIS APPROACH.

ULTROX INTERNATIONAL  
8780 NATIONAL BLVD  
CULVER CITY, CA 90232  
JACK D ZEFF

ARMY \$ 50,000

## TITLE:

CATALYTIC DECONTAMINATION OF EFFLUENT AIRSTREAMS FROM STRIPPING TOWERS

T 193

OFFICE: CERL/COE

THIS PROJECT IS TO RESEARCH AND DEVELOP A LOW-TEMPERATURE, COST-EFFECTIVE CATALYTIC AIR POLLUTION CONTROL SYSTEM CALLED D-TOX TO DESTROY LOW CONCENTRATION, VOLATILE ORGANIC COMPOUNDS (VOC'S) INCLUDING VOLATILE HALOGENATED ORGANICS (VHOC'S). THE OBJECTIVE OF THE PHASE I PROGRAM IS TO DETERMINE THE FEASIBILITY OF USING THIS D-TOX SYSTEM FOR DESTROYING VHOC'S EMISSIONS SUCH AS TCE, DCE, AND PCE FROM A STRIPPING TOWER USING AIR TO STRIP THE VHOC'S FROM WATER. IT HAS BEEN DETERMINED THAT A COMBINATION OF UV IRRADIATION AND A PROPRIETARY CATALYST CAN DESTROY SOME VHOC'S AND OTHER VOC'S IN DILUTE CONCENTRATION IN AIR. THE TEST PROGRAM IS DESIGNED TO CONDUCT PARAMETRIC EVALUATION ON A PILOT SCALE AND CARRY OUT TRADE-OFF STUDIES. THE RESULTS OF THE STUDIES WILL DETERMINE FEASIBILITY OF THE D-TOX SYSTEM TO DESTROY THESE PARTICULAR VHOC'S IN A SATURATED AIR STREAM. A PRELIMINARY ENGINEERING ANALYSIS WILL DETERMINE PROJECTED COSTS FOR USE OF STRIPPING TOWERS AND OTHER SOURCES VENTING VHOC'S IN SATURATED AIR.

UNIQUE MOBILITY INC  
3700 S JASON ST  
ENGLEWOOD, CO 80110  
GENE FISHER

DARPA \$ 48,935

## TITLE:

UNIQ KINETIC ENERGY STORING DEVICE

T 6

OFFICE: DARPA

UN QUE HAS A NOVEL APPROACH TO THE DESIGN OF A RELIABLE, ENERGY



FISCAL YEAR 1986

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EFFICIENT FLYWHEEL DEVICE. FROM TEST RESULTS OF EARLY PROTOTYPES, WE HAVE DETERMINED THAT A HIGH EFFICIENCY MOTOR/ALTERNATOR IN COMBINATION WITH THE FLYWHEEL/ROTOR OPERATING IN A SEALED VACUUM CONTAINER WITH ONLY ELECTRICAL INPUT AND OUTPUT CAN OVERCOME THE INEFFICIENCIES GENERALLY ASSOCIATED WITH MECHANICALLY GEARED DEVICES. AT THE HEART OF THIS CONCEPT IS UNIQUE'S ADVANCED ELECTROMAGNETIC TRANSDUCER (MOTOR) TECHNOLOGY WHICH REPRESENTS A QUANTUM LEAP IN THE DEVELOPMENT OF MOTOR/ALTERNATORS. THIS MOTOR TECHNOLOGY IS GENERICALLY SIMILAR TO A BRUSHLESS DC MOTOR; THE COMMUTATION IS ELECTRONIC, TORQUE IS PROPORTIONAL TO CURRENT AND BACK EMF IS PROPORTIONAL TO SPEED. AS APPLIED TO THE FLYWHEEL, THE UNIQ MOTOR/ALTERNATOR ALLOWS US TO PROPOSE THE DEVELOPMENT OF A HERMETICALLY SEALED, HIGH VACUUM FLYWHEEL IN AN EXTREMELY COMPACT PACKAGE.

UNIQUE MOBILITY INC 3700 S JASON ST ENGLEWOOD, CO 80110 JOHN GOULD TITLE: NAVY ROBOTIC PLATFORM T 122 OFFICE: NSWC	NAVY	\$ 59,342
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THIS PROPOSAL ADDRESSES THE NEED FOR AN UNMANNED MULTI-PURPOSE NAVY ROBOT SUITABLE FOR OUTDOOR, INDOOR OR SHIPBOARD USE. SUCH A VEHICLE CAN BE READILY DERIVED FROM UNIQUE'S PRIOR WORK ON HIGH PERFORMANCE FULL MOBILITY VEHICLE PLATFORMS. THIS PLATFORM, MADE POSSIBLE BECAUSE OF UNIQUE'S HIGHLY EFFICIENT PROPRIETARY ELECTRIC DRIVE SYSTEM, INCORPORATES FOUR WHEEL DRIVE WITH FOUR WHEEL 360 DEG STEER IN COMBINATION WITH A UNITIZED COMPOSITE BODY. AS PRESENTLY CONCEIVED, THIS VEHICLE HAS THE POTENTIAL TO OUTCORNER, OUT-CLIMB AND OUT-MANEUVER ANY KNOWN LAND VEHICLE. IT WILL ACCOMODATE AN INFINITE VARIETY OF ON-BOARD PAYLOAD PACKAGES AND SENSOR SUITES. IT IS THE TECHNICAL OBJECTIVE OF THE PHASE I EFFORT TO CONDUCT AND VERIFY A TRADE-OFF STUDY TO SELECT A "BEST" DESIGN CONFIGURATION WITHIN THE CONSTRAINTS OF KNOWN COST AND PERFORMANCE PARAMETERS AND THEN TO RENDER A FINAL DESIGN AND COST ANALYSIS OF THE PROPOSED MACHINE.

UNITED CHEMTECH CORP PO BOX 280 BROOKLINE, MA 02146 DR M L GOPIKANTH TITLE: NEW ELECTROLYTES FOR LITHIUM SULFURDIOXIDE RECHARGEABLE BATTERY T 77 OFFICE: LABCOM/ETDL	ARMY	\$ 49,997
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RECENTLY AN ALL INORGANIC AMBIENT, LOW PRESSURE LITHIUM NON-AQUEOUS

FISCAL YEAR 1986

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RECHARGEABLE BATTERY SYSTEM WAS DISCOVERED BY DURACELL. THIS SYSTEM CAN HAVE ENERGY DENSITIES HIGHER THAN 1000 Whr/kg, AND ALSO CAN DISCHARGE/CHARGE AT HIGH CURRENT RATE. IT IS THE OBJECTIVE OF THIS PROJECT TO COME OUT WITH MIXED INORGANIC-ORGANIC SOLVENTS/ELECTROLYTES TO MAKE THIS BATTERY SYSTEM FUNCTION EFFICIENTLY OVER A WIDE RANGE OF TEMPERATURE, AND APPLICATIONS. UNIQUE PROPERTY OF THIS BATTERY SYSTEM WOULD ALLOW TO USE DIFFERENT CATHODES TO TAILOR-MAKE BATTERIES FOR MANY USES. THE LATTER IS POSSIBLE WITH A GOOD SOLVENT AND ELECTROLYTE.

UNIVERSAL ENERGY SYSTEMS INC

AF

\$ 55,000

4401 DAYTON-XENIA RD

DAYTON, OH 45432

JOHN BAKER

TITLE:

COUNTERDOPED HIGH TEMPERATURE SILICON ARRAY INFRARED DETECTOR

T 151

OFFICE: AFWAL/ML

INFRARED DETECTORS OF HIGH QUANTUM EFFICIENCY ARE LIMITED TO OPERATING TEMPERATURES LOWER THAN 60K. THIS PROPOSAL PRESENTS A COUNTERDOPED DETECTOR WHICH WILL OPERATE ABOVE LIQUID NITROGEN TEMPERATURE AND THUS REDUCE THE SIZE AND WEIGHT OF THE COOLING SYSTEM USED FOR THE DETECTOR IN AN EARTH-ORBITING SPACECRAFT. THE OBJECTIVE OF THIS PHASE I PROGRAM WILL BE TO DEVELOP EXPERIMENTAL AND THEORETICAL CONFIRMATION THAT THE COUNTERDOPED (BORON-DIVACANCY) INFRARED DETECTOR WILL PRODUCE A HIGH BLIP TEMPERATURE INFRARED DETECTOR FOR THE 3-5 MICRON WINDOW. FLOAT ZONE SILICON CRYSTALS ARE GROWN WITH BORON LEVELS IN THE RANGE OF  $1 \times 10$  TO THE 16TH POWER -  $1 \times 10$  TO THE 17TH POWER ATOMS/cm<sup>3</sup>. ELECTRON BEAM IRRADIATION WITH 2 MeV ELECTRONS WILL CREATE DIVACANCIES. HEAT TREATMENT, TO ANNEAL CRYSTALLINE DAMAGE AND YET NOT DESTROY THE DIVACANCY, WILL BE PERFORMED AND PHOTOCONDUCTIVITY SAMPLES FABRICATED. ANALYSIS (EXPERIMENTAL AND THEORETICAL) OF THE SILICON SLICES WILL BE PERFORMED AT EACH STEP IN PROCESSING TO UNDERSTAND THE PROPERTIES OF THE COUNTERDOPED SYSTEM AND TO VERIFY THE USEFULNESS OF THIS CONFIGURATION AS A HIGH BLIP TEMPERATURE 3-5 MICRON INFRARED DETECTOR. ARRAY STRUCTURES MAY BE DEVELOPED USING ION IMPLANTATION TECHNIQUES. THE ION IMPLANTATION APPROACH PRODUCES A UNIFORM SUBSTRATE FOR ARRAY CONSTRUCTION AND INSURES REPRODUCIBILITY OF RESPONSE WITH AN ARRAY AND BETWEEN ARRAYS.

FISCAL YEAR 1986

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UNIVERSAL ENERGY SYSTEMS INC 4401 DAYTON-XENIA RD DAYTON, OH 45432 GARY E STREBY TITLE: SOLID FUEL RAMJET AND DUCTED ROCKET PROPULSION FOR MISSILES T 181 OFFICE: AFWAL/PO	AF	\$ 52,600

THE PROPOSED PHASE I PROGRAM WILL EVALUATE THE CAPABILITIES OF AN INFRARED THERMAL IMAGING SYSTEM TO ACQUIRE THERMAL ENERGY PROFILES FROM OBSERVATIONS OF BARE-WALL COMBUSTORS. SUCH A TECHNIQUE FOR THE ACQUISITION AND STORAGE OF THERMAL HEATING DATA WOULD ASSIST IN THE ANALYSIS OF COMBUSTION AND HEATING PROCESSES; IN STUDYING HEAT TRANSFER COEFFICIENTS OF MATERIALS; AND INTERNAL REACTION PROCESSES. THE DIGITIZED THERMAL DATA COULD THEN BE PROCESSED AND ANALYZED TO OBTAIN FULL VIEW HEATING CHARACTERISTICS OF COMBUSTORS. THE SUCCESSFUL APPLICATION OF THIS TECHNOLOGY WOULD REDUCE THE COSTS OF MODIFYING TEST APPARATUS FOR THERMOCOUPLE INSTALLATIONS AND REDUCE THE TIME NECESSARY TO OBTAIN THERMAL PROFILES OF COMBUSTOR CONFIGURATIONS USING PRESENT DAY TECHNIQUES.

UNIVERSITY RESEARCH & DEV ASSOCS INC 4516 HENRY ST - STE 407 PITTSBURGH, PA 15213 DR MARLIN H MICKLE TITLE: A CONTROLLABLE CAMERA TECHNIQUE FOR HIGH SPEED MACHINE VISION T 29 OFFICE: ARDC/SMCAR	ARMY	\$ 47,301
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THE BASIS OF THIS PROPOSAL IS THE DEVELOPMENT OF AN INEXPENSIVE CAMERA (TRACKER) AND SUPPORT ALGORITHMS THAT CAN BE USED TO TRACK A TARGET TRAJECTORY IN A CONTINUOUS PATH (CP) MOTION. THE BASIS OF THE TRACKER WILL BE A SIMPLE CAMERA BUILT FROM COMMERCIALY AVAILABLE RECTANGULAR (AREA) ARRAYS OF CHARGE COUPLED DIODES (CCD'S). BECAUSE THE TARGET PRECISION REQUIRED MAY BE LESS THAN CERTAIN DEFENSE SYSTEMS, THE TARGET CAN BE IMAGED OPTICALLY ON LESS THAN THE ENTIRE ARRAY. THIS WOULD ENABLE CERTAIN LIMITED MOTION ON THE ARRAY WITHOUT CORRESPONDING MECHANICAL MOTION THUS REDUCING THE MECHANICAL DELIVERY SYSTEM PRECISION AND JITTER REQUIREMENTS ON THE TRACKING DEVICE. THE CURRENTLY AVAILABLE CCD ARRAYS MAKE POSSIBLE A SENSING ELEMENT THEY MAY BE LOGICLLY CONTROLLED TO PRODUCE THE

FISCAL YEAR 1986

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## PROPOSED SYSTEM.

UNIVERSITY RESEARCH ENGINEERS & ASSOCS 166 PERKINS ROW TOPSFIELD, MA 01983 THOMAS F CALLAHAN TITLE: RAPID DEPLOYMENT OF ELECTRIC POWER CABLES - NOVEL CONCEPT T 98 OFFICE: BRDC	ARMY	\$ 47,480
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MERADCOM IS REDUCING THE NUMBER OF GENERATORS IN THE FIELD; MANY MODERN WEAPONS DEPEND ON ELECTRICITY; THUS, A COMBAT MISSION'S SUCCESS MAY TURN ON THE ABILITY TO RAPIDLY DEPLOY ELECTRIC CABLES AND CONNECTORS. THE IMPORTANT DESCRIPTIVE CHARACTERISTICS OF THE CONCEPT ARE RAPID, MOBILE, RELIABLE & FLEXIBLE (RMRF). THE HALLMARK OF THE SYSTEM IS ITS FLEXIBILITY. THE CONCEPT WOULD EMPLOY A PRE-COILED CABLE STORED IN A COLLAPSIBLE CONTAINER AND A LAUNCHING DEVICE TO PROPEL ONE END OF THE CABLE THROUGH THE AIR. THE CONCEPT ALSO RECOGNIZES THE NEED TO MINIMIZE THE VARIETY OF SPECIALIZED EQUIPMENT IN THE FIELD AND WILL UTILIZE EXISTING COMBAT HARDWARE TO LAUNCH THE CABLE/CONNECTOR TOWARD ITS OBJECTIVE. IF HOWEVER, IN THE TURMOIL OF COMBAT, THE PRIMARY SYSTEM IS UNAVAILABLE, THE FLEXIBLE SYSTEM IS DESIGNED TO PERMIT THE USE OF ANY ONE OF SEVERAL SECONDARY DEPLOYMENT OPTIONS. THE CRITICAL, PHASE I, TECHNICAL ISSUES ARE: (1) TO ELIMINATE THE CABLE'S TENDENCY TO KINK BY PROPER COILING OR DEPLOYMENT METHODS (EXTERIOR BALLISTICS); (2) TO ESTABLISH THE OPTIMUM LAUNCHING DEVICE AND ADAPTOR KIT; (3) TO CONFIGURE THE COLLAPSIBLE PACKAGE. THE PI HAS PARTICIPATED IN SEVERAL RAPID DEPLOYMENT PROGRAMS.

UPDATE R&D PO BOX 1328 - 221 HERITAGE OAK DR GLENORA, CA 91740 D M YEE TITLE: THE M-PLANNER EXPERT SYSTEM T 150 OFFICE: NWSC	NAVY	\$ 49,529
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EXISTING MANUAL MODE OF MANUFACTURING PLANNING IS NOW BEING  
RECOGNIZED AS A CRITICAL LINK IN OUR MANUFACTURING SECTOR'S DRIVE

FISCAL YEAR 1986

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FOR TOTAL QUALITY-INTEGRATED-PRODUCTIVITY ATTAINMENT THROUGH THE IMPLEMENTATION OF "PAPERLESS" FACTORY OPERATIONS. THERE IS A PRESSING NEED TO CAPTURE KNOWLEDGE BASE OF EXPERIENCED PLANNERS, INCORPORATE THIS KNOWLEDGE INTO AN "INTELLIGENT PLANNING ASSISTANT" SERVING BOTH AS AN EXPERT SYSTEM FOR THE PLANNING PROCESS AND AS A SELF-HELP TUTOR FOR NEW OR LESSER EXPERIENCED PLANNER, AND INTEGRATE THIS "INTELLIGENT ASSISTANT" INTO A MANUFACTURING HOMEOSTASIS FOR SELF-ADAPTIVE LEARNING BASED UPON EXPERIENCES FROM THE PRODUCTION FLOOR. THE OBJECTIVE OF THIS PROJECT IS TO DEVELOP THESE CAP-ABILITIES.

VANCE SYSTEMS INC 3901 V BONANZA BLVD-DULLES BUSINESS PARK CHANTILLY, VA 22021 WAYNE A MACK TITLE: PERFORMANCE ANALYSIS TOOLS T 99 OFFICE: NSWC	NAVY	\$ 48,747
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THIS PROPOSAL DEMONSTRATES THE REQUIREMENT FOR AND ADDRESSES THE DEVELOPMENT OF A MODEL OF AN IEEE 802.4 TOKEN PASSING BUS PROTOCOL WHICH OPERATES IN REAL TIME. THE ADVANTAGE OF THE REAL TIME APPROACH IS THAT IT EXTENDS THE EFFECTIVE LIFE OF THE MODEL TO INCLUDE NOT ONLY THE SYSTEM DESIGN PHASE, BUT ALSO THE SYSTEM MODIFICATION AND UPGRADE PHASES WHICH TYPICALLY OCCUR DURING THE LIFE CYCLE OF MILITARY SYSTEMS. THE CHARACTERISTIC OF REAL TIME EXECUTION ALLOWS THE MODEL TO BE INTEGRATED INTO EXISTING SYSTEMS IN ORDER TO PERFORM NON-INTRUSIVE TESTING AND SYSTEM LOAD SIMULATIONS. THE TECHNICAL INNOVATION ASSOCIATED WITH THIS PROPOSAL IS THE USE OF A DEDICATED, HIGH SPEED PROCESSING ELEMENT WHICH PERMITS OPERATION OF THE MODEL IN REAL TIME.

VATELL CORP 910 CARDINAL DR CHRISTIANSBURG, VA 24073 LAWRENCE W LANGLEY TITLE: TERNARY KEYBOARD CONCEPT EVALUATION T 94 OFFICE: NSWC	NAVY	\$ 50,000
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1. TO CONSTRUCT PROTOTYPE AND TEST CONCEPT FOR TERNARY

FISCAL YEAR 1986

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KEYBOARD WHICH MIGHT BE GENERALLY USEFUL FOR DATA ENTRY. KEYBOARD IS UNCONVENTIONAL IN CONSTRUCTION AND CAN ONLY BE EVALUATED EXPERIMENTALLY BECAUSE HUMAN FACTORS WILL REGULATE ITS UTILITY.

VERAC INC 9605 SCRANTON RD - STE 500 SAN DIEGO, CA 92121 DONALD KURPIEWSKI TITLE: GRAPHICS POST PROCESSORS FOR TSARAND DYNA-METRIC LOGISTICS MODELS T 287 OFFICE: AMD/RDO	AF	\$ 51,022
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VERAC PROPOSES TO USE ITS EXTENSIVE COMPUTER SCIENCE AND SOFTWARE EXPERTISE TO SHOW THE FEASIBILITY OF THE DEVELOPMENT OF A GRAPHICS POST-PROCESSOR FOR THE TSAR AND DYNA-METRIC LOGISTICS MODELS. TO ACCOMPLISH THIS, VERAC WILL PERFORM A SURVEY OF IDENTIFIED USERS TO DETERMINE SPECIFIC NEEDS FOR THE GRAPHICAL REPRESENTATION OF OUTPUT FROM THESE MODELS AND WILL GENERATE A PRELIMINARY DESIGN AND DEVELOPMENT SPECIFICATION OF SOFTWARE REQUIRED TO SATISFY THESE NEEDS. VERAC HAS INTIMATE EXPERIENCE IN THE USE OF TSAR, DYNA-METRIC, AND RELATED MODELS IN SUPPORT OF RECENT AND CURRENT EFFORTS IN THE ANALYSIS OF AIRBASE SUPPORT OPERATIONS. IN ADDITION, VERAC HAS A STRONG CAPABILITY IN THE DESIGN AND DEVELOPMENT OF TURNKEY COMPUTER SYSTEMS SUCH AS THE AIRFIELD DAMAGE ASSESSMENT SYSTEM (ADAS), WHICH FEATURES MENU-DRIVEN CAPABILITY, GRAPHICAL OUTPUT AND DATA BASE MANAGEMENT. THE DESIGN SPECIFICATION WILL PROVIDE AN ASSESSMENT OF THE EXTENT OF THE SOFTWARE DEVELOPMENT REQUIRED AND COULD BE USED IN A PHASE II EFFORT TO TRANSITION TO ACTUAL CODE DEVELOPMENT.

VERAC INC 9605 SCRANTON RD - STE 500 SAN DIEGO, CA 92121 LARRY JOBSON TITLE: C3I TECHNOLOGY SURVEY T 217 OFFICE: BMO/MYSC	AF	\$ 72,991
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THIS PROGRAM IS TO CONDUCT A C3I TECHNOLOGY DESIGNED TO EXAMINE THE IMPACT OF THESE TECHNOLOGIES ON THE EXPLOITATION OF SOVIET MOBILE MISSILE SYSTEMS. THE SURVEY WILL EXAMINE TECHNOLOGIES AND METHODO-

FISCAL YEAR 1986

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LOGIES THAT COULD BE USED TO INTEGRATE C3I SUBSYSTEMS INTO C3I/BATTLE MANAGEMENT SYSTEMS. SHORTFALLS OF CURRENT AND PROJECTED C3I/BATTLE MANAGEMENT SYSTEMS WILL BE IDENTIFIED AND TRADEOFFS WILL BE ADDRESSED.		

VERAC INC 9605 SCRANTON RD - STE 500 SAN DIEGO, CA 92121 LAWRENCE B JOBSON TITLE: EXPLOITATION OF TACTICAL WARFARE TECHNOLOGY FOR STRATEGIC WARFARE T 221 OFFICE: BMO/MYSC	AF	\$ 59,990
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THIS PROPOSAL PRESENTS AN OVERVIEW OF AN APPROACH TO THE ISSUES, METHODOLOGIES, AND TECHNOLOGIES THAT AFFECT AIR FORCE STRATEGIC PLANNING IN RELATIONSHIP TO BALLISTIC MISSILE WARFARE. THERE ARE MANY ASSETS BEING DEVELOPED BY THE MILITARY SERVICES FOR USE IN THE TACTICAL ARENA THAT COULD ASSIST IN ACCOMPLISHING THE MISSION OF LOCATING AND DESTROYING TIME SENSITIVE STRATEGIC TARGETS SUCH AS MOBILE MISSILES. A STUDY TO DETERMINE THE POTENTIAL IMPACTS OF THESE TACTICAL METHODOLOGIES AND TECHNOLOGIES ON THIS ISSUE WOULD BE GREATLY BENEFICIAL TO AIR FORCE PLANNERS.

VERAC INC 9605 SCRANTON RD - STE 500 SAN DIEGO, CA 92110 TOM M BOMBER TITLE: TARGET ASSESSMENT DAMAGE BY BALLISTICALLY DELIVERED SENSORS T 222 OFFICE: BMO/MYSC	AF	\$ 55,597
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OUR TECHNICAL APPROACH TO ASSESSING THE VALUE AND FEASIBILITY OF RV DELIVERED DAMAGE ASSESSMENT SENSORS IS BUILT UPON OUR SUCCESSFUL APPROACH OF ANALYZING, DEFINING, DEVELOPMENT AND TESTING AN AIR FORCE RUNWAY REPAIR AIRBORNE DAMAGE ASSESSMENT SYSTEM. THE APPROACH CALLS FOR A CAREFUL PROBLEM DEFINITION WHICH INCLUDES ASSESSMENT OF CONCEPT OPTIONS AND DAMAGE OBSERVABLE DATA BASES, FOLLOWED BY THE DEFINITION OF POTENTIALLY PROMISING SYSTEM CONCEPTS WHICH INCLUDES SENSOR ON DATA PROCESSING SYSTEM DEFINITION AND SIZING. FINALLY A CONCEPT ANALYSIS EFFORT TO ASSESS THE FEASIBILITY OF THE CANDIDATE CONCEPTS BASED ON PRIOR TECHNOLOGY AND DELIVERY PLATFORM CONSTRAINTS. THIS

FISCAL YEAR 1986

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PROCESS OF PROBLEM DEFINITION, CANDIDATE CONCEPT DEFINITION AND CONCEPT ANALYSIS WILL PROVIDE A VERY ACCURATE AND SYSTEMATIC ASSESSMENT OF THE VALUE AND FEASIBILITY OF REALISTICALLY DELIVERED DAMAGE ASSESSMENT SENSOR AND PROVIDE THE AF WITH THE NECESSARY INFORMATION TO DECIDE WHETHER OR NOT TO PURSUE THIS POTENTIALLY HIGH PAYOFF CONCEPT. THIS TECHNICAL APPROACH LED TO THE SUCCESSFUL DEVELOPMENT OF THE ADVANCED DAMAGE ASSESSMENT PROBLEM FOR THE TACTICAL AIR FORCE. THIS IS A VERY LOW RISK APPROACH WITH A VERY HIGH POTENTIAL PAYOFF BASED ON VERAC'S PAST EFFORTS AND EMINENTLY QUALIFIED TECHNICAL PERSONNEL.

VERITAY TECHNOLOGIES INC  
PO BOX 305 - 4845 MILLERSPORT HWY  
EAST AMHERST, NY 14051  
ROBERT L TALLEY

ARMY

\$ 49,666

TITLE:

LIQUID GUN DIAGNOSTICS

T 35

OFFICE: ARDC/SMCAR

GUNS USING LIQUID PROPELLANTS (LPG) HAVE BEEN A TOPIC OF INTEREST FOR ABOUT 40 YEARS. DURING THAT PERIOD MUCH RESEARCH AND DEVELOPMENT HAS BEEN DEVOTED TO THIS TOPIC AND GREAT EMPHASIS WAS PLACED ON HARDWARE DEVELOPMENT. DIAGNOSTIC INSTRUMENTATION, ON THE OTHER HAND, CONSISTED MAINLY OF THE PRESSURE AND PROJECTILE VELOCITY MEASUREMENTS TRADITIONALLY USED IN GUN AND SOLID PROPELLANT RESEARCH AND DEVELOPMENT. WHILE PROGRESS HAS BEEN MADE, THERE REMAIN AREAS OF TECHNICAL UNCERTAINTY PERTAINING TO IGNITION AND COMBUSTION PHENOMENA. THE PROPOSED PROGRAM WOULD EXPAND THE AVAILABLE DIAGNOSTICS USED FOR LPG RESEARCH AND DEVELOPMENT BY EXPLORING USE OF AN INSTRUMENTATION PACKAGE THAT INCORPORATES OPTICAL, PRESSURE AND THERMAL MEASUREMENTS AS WELL AS HIGH-SPEED MOTION PICTURES. WHILE NOT NEW, OPTICAL AND THERMAL INSTRUMENTATION IS PRESENTLY NOT BEING USED, TO THE DETRIMENT OF CURRENT LPG R&D PROGRAMS. THUS, THE PURPOSE OF THE PROPOSED PROGRAM IS TO EXPAND AND IMPROVE ON PREVIOUS ATTEMPTS AT DIAGNOSTIC INSTRUMENTATION IN ORDER TO FIND ANSWERS FOR SOME OF THE PERPLEXING QUESTIONS CONCERNING LPG IGNITION AND COMBUSTION PHENOMENOLOGY.

VERITAY TECHNOLOGY INC  
PO BOX 305 - 4845 MILLERSPORT HWY  
EAST AMHERST, NY 14051  
GERALD A STERBUTZEL

ARMY

\$ 50,000

TITLE:

MULTI-PURPOSE HUMAN CORE TEMPERATURE MEASUREMENT DEVICE

T 219

OFFICE: AMRDC/SGRD

THE PROPOSED TEMPERATURE MEASURING DEVICE IS A MULTIPURPOSE ONE. IT



FISCAL YEAR 1986

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CAN GIVE INSTANTANEOUS ORAL AND DEEP BODY TEMPERATURES BUT BECAUSE OF ITS ELECTRONIC SERVO SYSTEM CAN MEASURE SKIN SURFACE TEMPERATURE WITH GREAT SPEED AND ACCURACY--THUS IT CAN BE USED BECAUSED OF ITS SPEED AND ACCURACY TO RELATE VARIOUS EXTERNAL TEMPERATURES TO HUMAN CORE TEMPERATURES IN A MANNER HERETOFORE IMPOSSIBLE. THE PROJECT OBJECTIVES ARE TO TAKE THE SYSTEM'S OPERATING PRINCIPLES AND EVOLVE THEM INTO OPTIMAL CONFIGURATIONS FOR USERS IN VARIOUS MEDICAL FIELDS. THE EFFORT REQUIRES THREE TASKS: 1. DEVELOP TECHNIQUES TO REPRODUCIBLY FABRICATE THE MINUTE SENSOR; 2. REDESIGN THE POWER CONTROLLER TO BE COMPATIBLE WITH THE LOW POWER AND CONTROL REQUIREMENTS; AND 3. ARRANGE THE TEMPERATURE READOUT SYSTEM TO BE COMPATIBLE WITH USER REQUIREMENTS.

VEXCEL CORP  
2905 WILDERNESS PL  
BOULDER, CO 80301  
DR FRANZ W LEBERL

ARMY

\$ 49,591

TITLE:

SMART MAP-TO-IMAGE MATCHING SYSTEM DEVELOPMENT  
T 187 OFFICE: ETL/COE

WE PROPOSE TO STUDY THE FEASIBILITY, AND SUBSEQUENTLY BUILD A PROTOTYPE, OF A SYSTEM FOR AUTOMATED MATCHING OF IMAGES AND MAP DATA BASES. THIS WILL BE BASED ON AN EVALUATION OF APPROPRIATE MAP DATA BASE STRUCTURES TO ADDRESS, SEARCH FOR AND RANK OBJECTS THAT ARE CANDIDATE GROUND CONTROL. IT WILL FURTHER BE BASED ON USING NOT ONLY POINT-TYPE CONTROL, BUT ALSO LINEAR AND AREAL FEATURES FROM THE DATA BASE. THE SENSING GEOMETRY NEEDS TO BE PHOTOGRAMMETRICALLY MODELED TO RELATE MAP OBJECTS TO CONJUGATE IMAGE FEATURES. THE ACTUAL MATCHING PROCESS IS ANTICIPATED TO EMPLOY THE CONCEPT OF "MAP-GUIDED" FEATURE RECOGNITION, WHERE MAP-GUIDANCE IS IN THE FORM OF DEFINED OBJECTS AND LIMITED SEARCH SPACES. PHASE I EFFORTS WILL CONCENTRATE ON AN ELABORATE FEASIBILITY STUDY WITH ALGORITHMIC EVALUATIONS AND COMPUTATIONS WITH TEST DATA SETS.

VIGYAN RESEARCH ASSOCS INC  
28 RESEARCH DR  
HAMPTON, VA 23666  
R N GUPTA

AF

\$ 50,000

TITLE:

LOW DENSITY FLOW EFFECTS FOR HYPERVELOCITY VEHICLES  
T 127 OFFICE: AFWAL/FI

THE HYPERSONIC VEHICLES FLYING AT HIGH ALTITUDES OPERATE IN A FLOW

FISCAL YEAR 1986

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REGIME WHERE THE NONCONTINUUM EFFECTS NEAR THE SURFACE AND FINITE SHOCK THICKNESS DUE TO LOW-DENSITY MAKE THE CONVENTIONAL CONTINUUM TECHNIQUES GROSSLY INADEQUATE. CHEMICAL NONEQUILIBRIUM IS ALSO IMPORTANT UNDER THE LOW-DENSITY FLOW CONDITIONS. UNTIL RECENTLY NOT MUCH WORK HAS BEEN DONE TO EVALUATE DEFICIENCIES OF THE EXISTING CONTINUUM TECHNIQUES TO ANALYSE THE LOW-DENSITY FLOWS AND FIND MEANS TO REMOVE THEM. RECENTLY COMPLETED DETAILED WORK BY THE PRINCIPLE INVESTIGATOR SUGGESTS THE WAYS AND MEANS TO EVOLVE AN EFFICIENT AND PRACTICAL CONTINUUM COMPUTATIONAL TECHNIQUE. THIS TECHNIQUE WOULD BE CAPABLE OF HANDLING CHEMICAL NONEQUILIBRIUM, FINITE SURFACE CATALYCITY, AND HIGHLY TEMPERATURE-DEPENDENT TRANSPORT AND THERMODYNAMIC PROPERTIES FOR DISSOCIATED AIR UNDER THE LOW-DENSITY FLIGHT CONDITIONS.

VISIDYNE INC 10 CORPORATE PL - S BEDFORD ST BURLINGTON, MA 01803 HENRY J P SMITH TITLE: USE OF FRACTAL GEOMETRY IN FIREBALL MODELING T 1 OFFICE: AM/SBIR	DNA	\$ 54,889
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THE WORK OF MANDELBROT HAS SHOWN THAT FRACTALS CAN BE USED EFFECTIVELY TO MODEL WITH COMPUTER GRAPHICS MANY TYPES OF NATURAL SHAPES AND FIGURES. THESE INCLUDE GEOGRAPHICAL FEATURES AS WELL AS CLOUDS AND TURBULENT FLUID BEHAVIOR. IT IS PROPOSED TO APPLY FRACTAL GEOMETRY IN A PURELY PHENOMENOLOGICAL FASHION TO THE MODELING OF FIREBALL SHAPES AND TEXTURES FOR POSSIBLE APPLICATION IN SUCH NUCLEAR EFFECTS CODES AS NORSE. THE AIM WILL BE TO PROVIDE IMPROVEMENTS IN SHAPE MODELS AND IN SOME ASPECTS OF FIREBALL STRUCTURE.

VISIDYNE INC 10 CORPORATE PL - S BEBFORD ST BURLINGTON, MA 01803 THOMAS J KENESHEA TITLE: ALGORITHM TO REMOVE STIFFNESS FROM THE SOLUTION OF THE CHEMICAL REACTION RATE EQUATIONS IN NUCLEAR EFFECT CODES T 1 OFFICE: AM/SBIR	DNA	\$ 70,710
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THE PRIMARY TECHNICAL OBJECTIVE OF THE PROPOSED RESEARCH IS TO

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DEPT

AWARDED  
AMOUNT

DEVELOP AN ALGORITHM THAT WILL REMOVE THE STIFFNESS PROBLEM INHERENT IN SETS OF ORDINARY DIFFERENTIAL EQUATIONS FOR THE CHEMICAL KINETICS OF ATMOSPHERIC GASES. THE ALGORITHM SHALL BE SUCH AS TO BE EASILY INCORPORATED INTO A NUCLEAR EFFECTS CODE IN ORDER TO PERMIT IT TO PROVIDE OUTPUTS AT TIMES LATER THAN ARE NOW PRACTICAL IN SOLVING THE CHEMICAL KINETICS EQUATIONS DIRECTLY. ALTHOUGH SEVERAL MATHEMATICAL TECHNIQUES EXIST FOR SOLVING LARGE SETS OF STIFF DIFFERENTIAL EQUATIONS, MORE IS ACCEPTABLE FOR IMPLEMENTATION IN NUCLEAR EFFECTS CODES. THE REASON IS THAT THESE MATHEMATICAL APPROACHES STILL REQUIRE CONSIDERABLE COMPUTER RESOURCES. SINCE THE CHEMICAL KINETICS COMPUTATIONS IN MOST NUCLEAR EFFECTS CODES IS GENERALLY A SMALL PERCENTAGE OF THE TOTAL EFFECTS CALCULATION, THE AMOUNT OF CENTRAL MEMORY AS WELL AS THE RUNNING TIME ALLOCATED TO THE CHEMISTRY MUST BE MINIMIZED. THIS PROPOSED STUDY SHOULD PRODUCE AN ALGORITHM THAT WILL SATISFY THESE REQUIREMENTS.

VISTA CONTROLS CORP  
21704 W GOLEN TRIANGLE RD  
SAUGUS, CA 91350  
RONALD L RAMBIN

ARMY

\$ 49,739

TITLE:

APPLICATION OF ROBOTIC VISION IN A WEAPON SYSTEM-FEASIBILITY STUDY

T 2 OFFICE: ARDC/SMCAR

THIS STUDY WILL EXAMINE THE CONCEPTS INVOLVED IN USING VISION TO ENHANCE THE OPERATION OF A ROBOTIC AMMUNITION HANDLING SYSTEM (INTEGRATED SMART ARTILLERY SYNTHESIS, OR ISAS), AND WILL DEFINE THE TECHNOLOGY REQUIRED TO IMPLEMENT SUCH A SYSTEM. THE VISION SYSTEM WILL PROVIDE REAL-TIME INFORMATION TO AN ELECTRONIC CONTROL UNIT ON SYSTEM STATUS DATA (PRESENTLY SENSED BY SWITCHES OR NOT SENSED AT ALL) AND CLOSED-LOOP CONTROL PARAMETERS. THIS COULD REPLACE A MULTITUDE OF SYSTEM SENSORS NECESSARY TO INCORPORATE A HIGHER LEVEL OF ARTIFICIAL INTELLIGENCE AND AUTONOMOUS OPERATION. PRESENT LARGE DATABASES WOULD BE REPLACED BY REAL-TIME INFORMATION ACQUISITION ALONG WITH GENERIC CLOSED-LOOP CONTROL ROUTINES AND AUTOMATIC SWITCHING LOGIC TO CONTROL AMMUNITION HANDLING IN A RAPIDLY CHANGING ENVIRONMENT.

VISTECH CONSULTANTS INC  
1372 N FAIRFIELD RD  
DAYTON, OH 45432  
DR ARTHUR P GINSBURG

AF

\$ 48,139

TITLE:

SUPERTHRESHOLD CONTRAST SENSITIVITY VISION TEST CHART

T 10 OFFICE: AFOSR/XOT

VISUAL ACUITY HAS BEEN THE MAINSTAY OF MILITARY VISION STANDARDS

FISCAL YEAR 1986

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SINCE 1913. SINCE THEN, HOWEVER, VISUAL ACUITY HAS BEEN SHOWN NOT TO RELATE WELL TO VISUAL PERFORMANCE. RECENTLY, CONTRAST SENSITIVITY USING SINE-WAVE GRATINGS HAS BEEN SHOWN IN THE LABORATORY, IN FLIGHT SIMULATORS, AND IN FIELD STUDIES TO RELATE TO INDIVIDUAL DIFFERENCES IN VISUAL TARGET DETECTION CAPABILITIES. ALTHOUGH TARGET DETECTION THRESHOLDS ARE AN IMPORTANT ASPECT OF PILOT VISUAL PERFORMANCE, MANY VISUAL TASKS IMPORTANT TO MILITARY CONSIDERATIONS ARE PERFORMED AT SUPRATHRESHOLD CONTRAST LEVELS. WE PROPOSE THAT A NEW VISION TEST CHART BE DEVELOPED TO MEASURE INDIVIDUAL DIFFERENCES IN SUPRATHRESHOLD CONTRAST PERCEPTION, AND TO SHOW HOW THEY RELATE TO PILOT PERFORMANCE. THIS SUPRATHRESHOLD CONTRAST SENSITIVITY TEST SYSTEM WILL USE THE PSYCHOPHYSICAL PROCEDURE OF CONTRAST MATCHING TO MEASURE AN INDIVIDUAL'S SUPRATHRESHOLD CONTRAST PERCEPTION OF SINE-WAVE GRATINGS FOR APPROPRIATE RANGES OF SPATIAL FREQUENCY AND CONTRAST. THE RESULTING DATA WILL PROVIDE AN ARRAY OF CURVES FROM JUST-ABOVE THRESHOLD TO HIGH SUPRATHRESHOLD, THEREBY ESTABLISHING A RANGE OF INDIVIDUAL SUPRATHRESHOLD VISUAL CAPABILITIES. THESE CURVES WILL BE SIMILAR TO THE LOUDNESS SENSITIVITY CURVES IN AUDITION. FOLLOW-UP RESEARCH WILL USE THESE VISION TEST CHARTS TO RELATE INDIVIDUAL DIFFERENCES IN SUPRATHRESHOLD CONTRAST SENSITIVITY TO AIR FORCE-RELATED PERFORMANCE TASKS.

W.J. SCHAFER ASSOC, INC.  
20501 VENTURA BLVD., SUITE 270  
WOODLAND HILLS, CA 91364  
RAYMOND F. WALSH IV  
TITLE:  
ULTRA HIGH THERMAL LASER HARDENING CONCEPT

SDIO \$ 89,903

T 8 OFFICE:

A NOVEL APPROACH IS PROPOSED TO PROTECT SURFACES AGAINST DAMAGE BY THERMAL LASERS. A THIN SHELL CONTAINING AN APPROPRIATE FLUID HAS THE POTENTIAL OF DELIVERING EFFECTIVE  $Q^*$  IN THE RANGE OF 150-300 KJ/GM. THIS PROGRAM WILL DEVELOP EFFECTIVENESS AND SCALING ALGORITHMS, DESIGN A TEST ARTICLE, AND CONDUCT A PROOF-OF-PRINCIPLE TEST.

W.J. SCHAFER ASSOC., INC.  
20501 VENTURE BLVD., SUITE 270  
WOODLAND HILLS, CA 91364  
JEFFREY B. SHELLAN  
TITLE:  
IMPROVING BEAM QUALITY THROUGH NOVEL OUTCOUPLING OF RADIATION FROM HIGH ENERGY LASERS - TECHNIQUES FOR

SDIO \$ 94,649

T 1 OFFICE:

SOME HIGH ENERGY LASERS SUCH AS FREE ELECTRON LASERS MAY REQUIRE A

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AMOUNT

RELATIVELY SMALL FRACTIONAL OUTPUT COUPLING DUE TO LOW GAIN PER PASS. FOR AN UNSTABLE RESONATOR DESIGN, THIS REQUIRES AN OUTPUT CONSISTING OF A THIN ANNULUS WHICH RESULTS IN INCREASED SENSITIVITY TO JITTER AND A REDUCED FAR-FIELD ON-AXIS INTENSITY, AS COMPARED TO A COMPACT OUTPUT BEAM. ON THE OTHER HAND, USING A STABLE RESONATOR INTRODUCES OTHER DIFFICULTIES WELL KNOWN IN THE HEL FIELD. THUS NEITHER STABLE NOR UNSTABLE RESONATORS GIVE ALL OF THE PROPERTIES DESIRED FOR SUCH A DEVICE, WHICH IS REFLECTED IN SOME CONTRACTORS PROPOSING STABLE RESONATORS WHILE OTHERS ARE PROPOSING UNSTABLE RESONATORS FOR FUTURE SYSTEMS. THE OBJECTIVE OF THIS WORK IS TO INVESTIGATE NOVEL RESONATOR DESIGNS OR RESONATOR OUTCOUPLING TECHNIQUES THAT COMBINE THE ADVANTAGES OF STABLE AND UNSTABLE RESONATORS FOR THESE APPLICATIONS. BOTH GEOMETRIC OPTICS AND LOADED-CAVITY PHYSICAL OPTICS COMPUTER CODES WILL BE USED TO ANALYZE SEVERAL PROMISING TECHNIQUES THAT HAVE BEEN IDENTIFIED.

WJC RESEARCH &amp; DEVELOPMENT &amp; IAP RES.

SDIO

\$ 50,000

1460 JEFFERSON HTS.

PITTSBURGH, PA 15235

W.J. CARR, JR.

TITLE:

NOVEL HEAT POWERED SUPERCONDUCTING INDUCTIVE STORE

T 5 OFFICE:

A NOVEL CONCEPT FOR A SUPERCONDUCTING INDUCTIVE STORE IS PROPOSED WHICH SOLVES THE PROBLEM OF (a) SWITCHING A LARGE CURRENTS, (b) HEAT CONDUCTION TO THE LOAD CIRCUIT AND (c) THE ESTABLISHMENT OF LARGE CURRENTS IN THE STORE. IT IS PLANNED TO "CHARGE" THE STORE BY APPLYING HEAT TO AN ENCLOSED FERROMAGNETIC MATERIAL. THE SUPERCONDUCTING CIRCUIT IS THERMALLY ISOLATED FROM THE LOAD CIRCUIT AND ENERGY TRANSFERRED TO THE LOAD THROUGH TRANSFORMER ACTION BY NORMALIZING THE SUPERCONDUCTOR. THUS THE INDUCTIVE STORE ACTS AS ITS OWN SWITCH AND POWER SUPPLY, IN ADDITION TO HAVING THE CAPABILITY OF STORING LARGE AMOUNTS OF MAGNETIC ENERGY. THE POSTULATED DEVICE HAS NO MOVING PARTS AND REQUIRES NO ELECTRICAL POWER. THEORY FOR THE INDUCTIVE STORE WILL BE DEVELOPED TO DEMONSTRATE ITS POTENTIALITIES, AND SUITABLE MATERIALS AND DIMENSIONS WILL BE IDENTIFIED FOR CONSTRUCTION OF A PROTOTYPE UNDER PHASE II.

WYVERN RESEARCH ASSOCS

ARMY

\$ 0

335 BEACH RD

BURLINGAME, CA 94010

DR DAVID M DROLL

TITLE:

IMPROVING REENLISTMENT THROUGH DECISION MAKING MODELING AND INTERVENTIONS

T 223 OFFICE: ARI/PE I

THE ARMY A86-223, WISHES TO UNDERSTAND AND MEASURE THE VARIABLES

FISCAL YEAR 1986

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AMOUNT

INDIVIDUALS CONSIDER IN THEIR DECISIONS TO JOIN THE ARMY OR REENLIST. THE PROPOSED PROJECT, "IMPROVING REENLISTMENT THROUGH DECISION MAKING MODELING AND INTERVENTIONS" ASSUMES THE INDIVIDUAL'S DECISION MAKING IS A COMPLEX AND DYNAMIC PROCESS, SHAPED OVER MONTHS, WITH CONTINUOUS INFORMATION EVALUATION. FURTHER, THE PROJECT ASSUMES MOST INDIVIDUALS EXAMINE MUCH THE SAME TYPES OF INFORMATION AND ACHIEVE SIMILAR CRITICAL POINTS OF DECISION MAKING ALONG THEIR PATH TO A FINAL INTENT TO JOIN OR REENLIST. THIS RESEARCH PROJECT WILL IDENTIFY THE CRITICAL POINTS LEADING TO THE INTENT TO REENLIST. USING THIS ACQUIRED INFORMATION, WE WILL INTERVENE AT SELECTED CRITICAL POINTS, WITH STRATEGIES INTENDED TO HELP PROGRESS THE REENLISTMENT DECISION. THE BENEFITS TO THE ARMY OF THE ABOVE EFFORTS ARE AS FOLLOWS: YOU WILL IDENTIFY CRITICAL CAREER POINTS DURING THE REENLISTMENT DECISION MAKING PROCESS; YOU WILL ESTABLISH EFFECTIVE INTERVENTION TECHNIQUES FOR THE CRITICAL POINTS; YOU WILL ENHANCE ARMY CAREER RETENTION THROUGH INCREASING DECISIONS; YOU WILL SAVE MONEY IN THE ASSESSING, DRESSING, AND TRAINING OF PERSONNEL; YOU WILL UTILIZE YOUR HUMAN RESOURCES MORE EFFICIENTLY.

X2Y2 CORP  
6071 BRISTOL PKWY  
CULVER CITY, CA 90232  
DR DOUGLAS E BLAGDON

NAVY

\$ 52,987

## TITLE:

AN INTELLIGENT SYSTEM FOR ACQUIRING MANUFACTURING PLANNING  
EXPERTISE

T 150

OFFICE: NWSC

IT IS PROPOSED THAT AN AUTOMATED LEARNING SYSTEM CAN BE DEVELOPED TO TRAP THE KNOWLEDGE OF AN EXPERIENCED MANUFACTURING PLANNER AND INCORPORATE IT INTO AN EXPERT SYSTEM. THE LEARNING SYSTEM WOULD WORK IN THE ENVIRONMENT OF AN EXPERIENCED PLANNER USING AN EXISTING AUTOMATED PLANNING SYSTEM (APS) TO DESIGN A SMALL PART. A RUDIMENTARY EXPERT SYSTEM WOULD BE CREATED FROM EXISTING SHELLS AND DESIGNED TO INTERFACE WITH THE APS. THE TASKS OF THE EXPERIENCED PLANNER USING THE APS WOULD BE RECORDED IN DETAIL. A MANUAL CYCLE OF COMPARISONS BETWEEN THE MANIPULATIONS OF THE EXPERT PLANNING SYSTEM (EPS) AND THE HUMAN EXPERT PLANNER WITH THE ASSISTANCE OF AN APS WOULD ENSURE. AS A RESULT OF THE COMPARISONS IN EACH CYCLE, EXCEPTIONS WOULD BE NOTED, THE HUMAN EXPERT PLANNER WOULD BE INTERVIEWED, AND MODIFICATIONS WOULD BE MADE TO THE EPS. THE CYCLES WOULD CONTINUE UNTIL THE EPS

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DUPLICATED THE EXPERIENCED PLANNER. A PHASE II EFFORT WOULD AUTO-  
MATE THE MANUAL CYCLES.

XEMET INC  
7525 BOBBYBOYAR AVE  
CANOGA PARK, CA 91304  
RICHARD B MINCH

DARPA \$ 59,783

TITLE:

HIGH THERMAL CONDUCTIVITY MATERIALS FROM ENCAPSULATED HEAT PIPES  
T 6 OFFICE: DARPA

HIGH CONDUCTIVITY IN MATERIALS IS CREATED BY THE ENCAPSULATION OF MICRO-SIZED HEAT PIPES WITHIN THE MATERIAL ITSELF. THE WROUGHT MATERIALS CONTAIN CAPILLARIES WHICH ARE PERFECTLY STRAIGHT, IN REGULAR ARRAYS, CAN BE FORMED IN ANY SHAPE, HAVE OPEN AREAS AS LARGE AS 70%, AND DIAMETERS AS SMALL AS 0.0004 INCH. USED AS HEAT PIPE ARTERIES AND VAPOR SPACES, AND TO FORM WICK STRUCTURES, HEAT PIPE CROSS-SECTIONAL DIMENSIONS ON THE ORDER OF SEVERAL MILS ARE POSSIBLE. ADDITIONALLY, THE MATERIALS CAN BE FORMED AND MACHINED WITHOUT DAMAGING THE CAPILLARIES. THE HEAT PIPES CAN BE DISTRIBUTED WITHIN THE MATERIAL BASED ON THE HEAT FLUX DISTRIBUTIONS OF THE DEVICE INTO WHICH THE MATERIAL IS INCORPORATED. IT IS PROPOSED THAT MATERIALS BE DESIGNED AND FABRICATED FOR EACH OF THREE APPLICATIONS: ELECTRICAL, MAGNETIC AND STRUCTURAL. A LARGE NUMBER OF METALS ARE LISTED AS CANDIDATES AND AS METALS WITH WHICH XEMET HAS EXPERIENCE. THESE ARE DISCUSSED, DEVICES DESCRIBED, AND PHOTOGRAPHS AND MICROPHOTOGRAPHS OF CAPILLARY STRUCTURES ARE SHOWN.

XEMET INC  
7525 BOBBYBOYAR AVE  
CANOGA PARK, CA 91304  
CHUNG-CHU WAN

ARMY \$ 60,364

TITLE:

NOVEL METHOD TO PRODUCE THIN FOILS OF WEAR RESISTANT MATERIAL  
T 127 OFFICE: LABCOM/MTL

THE NEED FOR LOW COST, HIGH PERFORMANCE, WEAR RESISTANT MATERIAL IS IDENTIFIED FOR APPLICATION TO TANK TRACKS, FORMING AND CUTTING TOOLS, BEARINGS, ETC. A NOVEL APPROACH IS PROPOSED WHICH COMPRISES A NUMBER OF DISCRETE STEPS TO PROVIDE THE DESIRED AND PROPERTIES. THESE STEPS

FISCAL YEAR 1986

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INCLUDE; MELT SPINNING AN IRON BASE ALLOY RIBBON; PRECIPITATING A HARD STABLE PHASE IN A UNIFORM DISTRIBUTION OF HIGH LOADING; HEAT-TREATING THE RIBBON CONTAINING THE DISPERSED PHASE TO OPTIMIZE THE STRENGTH AND DUCTILITY OF THE MATRIX PHASE. THE RIBBON DIMENSIONS WILL BE IN THE RANGE OF 20 TO 50 MICRONS THICK AND 3 TO 6 MM WIDE. THE EVALUATION OF THE FINAL RIBBON PRODUCT WILL INVOLVE HARDNESS MEASUREMENT, DUCTILITY AND BRAZING CHARACTERISTICS. IN PHASE II THE DEVELOPMENT EFFORT WILL BE DIRECTED TOWARDS: 1. WIDE RIBBON FABRICATION; 2. COMPOSITION OPTIMIZATION; 3. WEAR CHARACTERISTIC EVALUATION; 4. SELECTED PRODUCT PROTOTYPE DEVELOPMENT.

XMCO INC 11150 SUNRISE VALLEY DR RESTON, VA 22091 MARK C WIA NT TITLE: LOGISTIC REQUIREMENTS ADVISORY MODULE (LRAM) T 64 OFFICE: NAVSEA	NAVY	\$ 52,677
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AS A RESULT OF THEIR TRAINING, ENGINEERS ARE WELL VERSED IN APPLYING NECESSARY TECHNICAL REQUIREMENTS. THEY ARE LESS LIKELY, HOWEVER, TO BE FAMILIAR WITH LOGISTIC SUPPORT REQUIREMENTS OR CONTRACTUAL REQUIREMENTS FOR PRODUCTS NEEDED TO PROVIDE ESSENTIAL, TIMELY LOGISTIC SUPPORT OF PRODUCTS PROCURED UNDER CONTRACT. THE OBJECTIVE OF THE PHASE I STUDY IS TO DETERMINE THE POTENTIAL OF INNOVATIVE TECHNIQUES FOR BUILDING A COMPUTER LOGISTIC REQUIREMENTS ADVISORY MODULE (LRAM) TO HELP ENGINEERS DELINEATE PROPER LOGISTIC SPECIFICATIONS AND STANDARDS IN CONTRACTS. THE APPROACH INVOLVES (1) DEVELOPING A FRAMEWORK INTO WHICH A PROCUREMENT IS PLACED, E.G., TYPE OF PROCUREMENT (NEW PROCUREMENT, REPROCUREMENT, MODIFICATION, OR SUPPORT PROCUREMENT), ACQUISITION PHASE, INTEGRATED LOGISTIC SYSTEM (ILS) ELEMENT, AND COMMODITY; (2) IDENTIFYING APPLICABLE SPECIFICATIONS AND DATA ITEM DESCRIPTIONS WITH TAILORING REQUIREMENTS; (3) DEVELOPING A FUNCTIONAL SPECIFICATION FOR A COMPUTER LRAM; AND (4) SELECTING AN OPTIMUM ANALYTICAL/PROGRAMMING TECHNIQUES.

XMCO INC 11150 SUNRISE VALLEY DR RESTON, VA 22091 CHARLES J GARVEY TITLE: EXPLOSIVE ORDNANCE DISPOSAL ADVISOR SYSTEM (EODAS) T 165 OFFICE: NAVSEA/NTEC	NAVY	\$ 56,107
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THE ARMED SERVICES MAKE A SIGNIFICANT INVESTMENT IN PERSONNEL RE-



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AMOUNT

CRUISING AND TRAINING TO PRODUCE QUALIFIED EXPLOSIVE ORDNANCE DISPOSAL (EOD) EXPERTS. BY ANY STANDARD, THE MISSION OF EOD PERSONNEL IS ONE OF THE MOST HAZARDOUS DURING WAR OR PEACETIME. PRESENT METHODOLOGIES TO RENDER MUNITIONS SAFE REQUIRE THE EOD EXPERT TO ENDANGER HIS OR HER LIFE IN MANY SITUATIONS. IT IS CLEAR THAT THE REQUIREMENT EXISTS TO DEVELOP INNOVATIVE PROCESSES TO ENHANCE THE TRAINING AND SURVIVABILITY OF THESE CRITICAL EXPERTS. THE OBJECTIVE OF THE PHASE I STUDY IS TO DETERMINE THE POTENTIAL OF INNOVATIVE TECHNIQUES FOR ASSISTING THE EOD SPECIALIST IN TRAINING AND IN THE FIELD. THE APPROACH INVOLVES: (1) A LITERATURE SEARCH AND INTERVIEWS WITH EXPERTS IN THE FIELD; (2) ORGANIZING AND COLLATING ASSEMBLED DOCUMENTS AND INFORMATION; (3) CONDUCTING ANALYSIS OF NEEDS; AND REQUIREMENTS AND SETTING PRIORITIES FOR AN EOD ADVISOR SYSTEM (EODAS); (4) REVIEW ARTIFICIAL INTELLIGENCE TECHNIQUES AND EVALUATE FEASIBILITY TO DEVELOP AN EXPERT SYSTEM; (5) FORMULATE AND SELECT A CONCEPTUAL VIDEODISC SUPPORT SYSTEM; (6) PREPARE CONCLUSIONS, RECOMMENDATIONS, AND A FINAL FEASIBILITY REPORT.

XMCO INC  
11150 SUNRISE VALLEY DR  
RESTON, VA 22091  
ROBERT J WINKLARETH  
TITLE:

ARMY

\$ 49,918

LOGISTICS SUPPORT FOR NUCLEAR SURVIVABLE EQUIPMENT  
T 91 OFFICE: LABCOM/HDL

THE ARMY IS CONCERNED ABOUT PRESERVING THE NUCLEAR HARDNESS OF TACTICAL EQUIPMENT AFTER IT HAS BEEN PRODUCED AND FIELDDED. WHILE CONTRACTORS ARE REQUIRED TO DEVELOP INFORMATION ON MAINTAINING NUCLEAR HARDNESS OF EQUIPMENT IN THE FIELD, THIS INFORMATION MUST BE INTEGRATED INTO EQUIPMENT MANUALS, PROVISIONING TECHNICAL DOCUMENTATION AND OTHER ILS ELEMENTS. XMCO WILL FIRST BECOME MORE FAMILIAR WITH THE EFFECTS OF NUCLEAR WEAPONS AND THE MEANS THAT ARE TAKEN TO HARDEN EQUIPMENT AGAINST THOSE EFFECTS. XMCO WILL THEN ANALYZE THE ILS IMPLICATIONS OF MAINTAINING NUCLEAR HARDNESS FEATURES IN EQUIPMENT AND DEVELOP GENERAL PRINCIPLES FOR INTEGRATING NUCLEAR SURVIVABILITY CONSIDERATIONS INTO EACH ILS ELEMENT. THIS WILL BE ACCOMPLISHED BY AN XMCO STUDY TEAM WITH A PRINCIPAL INVESTIGATOR, SUPERVISED AND GUIDED BY A CORPORATE VICE PRESIDENT AND A REVIEW COMMITTEE TO ASSURE MEETING THE TECHNICAL OBJECTIVES OF THIS SBIR PROJECT.

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
XYNET CORP 265 BONHAM RD CINCINNATI, OH 45215 RICHARD P JOHNSTON TITLE: ADVANCED VARIABLE CYCLE (AVCD) ENGINE AND PRELIMINARY DESIGN OF AN ENGINE TIMING MECHANISM - EVALUATION AND DEFINITION T 114 OFFICE: TACOM/AMSTA	ARMY	\$ 44,500

AN ADVANCED CONCEPT FOR A VARIABLE CYCLE DIESEL ENGINE WILL BE EVALUATED ANALYTICALLY TO DETERMINE THE OPTIMUM SCHEDULING PARAMETERS FOR ENGINE CONTROL. A PRELIMINARY DESIGN OF THE TIMING MECHANISM FOR THE AVCD ENGINE WILL BE SPECIFIED.

YLYK LTD 2440 STONE ANN ARBOR, MI 48105 BOB BLAKLEY TITLE: REDUCTION OF FLOW DIAGRAMS TO UNFOLDED FORM MODULO SNARLS T 12 OFFICE: AFOSR/XOT	AF	\$ 49,973
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THIS PROPOSAL GIVES WHAT MAY BE THE FIRST EXAMPLES OF NONPLANAR FLOW DIAGRAMS, I.E. FLOW DIAGRAMS DESCRIBING CODE WHICH IS INTRINSICALLY INCAPABLE OF HAVING ALL UNCONDITIONAL BRANCHES REMOVED. SOME REFLECTION OF THE SIGNIFICANCE OF THESE EXAMPLES LEADS TO A REALIZATION THAT A VARIETY OF DESIRABLE GOALS IN SOFTWARE ENGINEERING ARE NOW BOTH DESIRABLE AND WITHIN REACH. IT IS PROPOSED TO SEEK TO ATTAIN SEVERAL GOALS INCLUDING: DEVELOPING AN ALGORITHM WHICH TAKES PURELY LOCAL INFORMATION ON RELATIONSHIPS BETWEEN PARTS OF A PROGRAM AND PRODUCES A GLOBAL FLOW DIAGRAM; DEVELOPING AN ALGORITHM FOR DETERMINING WHETHER THIS DIAGRAM IS PLANAR IN THE GRAPH-THEORETIC SENSE; DEVELOPING AN ALGORITHM WHICH TAKES THE SOLELY LOCAL INFORMATION IN A DIAGRAM KNOWN, ON MATHEMATICAL GROUNDS, TO BE PLANAR AND PRODUCES A PLANE DRAWING OF IT WITHOUT CROSSEOVERS; DEVELOPING AN ALGORITHM WHICH TAKES THE SOLELY LOCAL INFORMATION IN A DEMONSTRABLY NONPLANAR DIAGRAM AND PRODUCES A PLANE DRAWING OF IT WHICH HAS A (PROVABLY) MINIMAL NUMBER OF CROSSEOVERS; DEVELOPING ALGORITHMS FOR MOVING FROM LOCAL INFORMATION TO DRAWINGS WHICH ARE EXTREMELY INFORMATIVE IN

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DEFENSE SMALL BUSINESS INNOVATION RESEARCH PROGRAM  
(SBIR) ABSTRACTS OF PHASE I AWARDS (1986)(U) DEPARTMENT  
OF DEFENSE WASHINGTON DC 1986

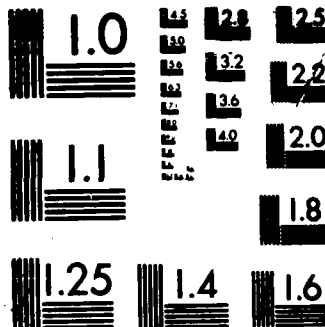
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MICROCOPY RESOLUTION TEST CHART  
NATIONAL BUREAU OF STANDARDS-1963-A

FISCAL YEAR 1986

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<p>GARD TO SOME CHOSEN ASPECT OF A PROPOSED PROGRAM; ELABORATING A THEORY OR 'NONPLANAR' PROGRAMS COMPARABLE IN POWER, AND COMPLEMENTARY IN SCOPE, TO STRUCTURED PROGRAMMING AS A THEORY OF PLANAR PROGRAMS; BUILDING HIGH PERFORMANCE NONPLANAR ALGORITHMS WHICH, BEING SUBJECT TO FEWER RESTRICTIONS, OUTPERFORM STRUCTURED PROGRAMS.</p>		

ZIGMED CORP  
16 MERRY LANE  
EAST HANOVER, NJ 07936  
ZSIGMOND L SAGI

ARMY \$ 49,852

## TITLE:

SELF-CONTAINED AMBULATORY INTRAVENOUS SYSTEM (SAIVIS)  
T 214 OFFICE: AMRDC/SGRD

IT IS THE OBJECTIVE OF THIS PROJECT TO PRODUCE PROTOTYPE SAMPLES OF ZIGMED'S SELF-CONTAINED AMBULATORY INTRA-VEINUS INFUSION SYSTEM (SAIVIS) FOR IN-VITRO, AND POSSIBLY IN-VIVO, TESTING. ZIGMED'S INTRAVENOUS DELIVERY SYSTEM IS A LIGHTWEIGHT, ARM-MOUNTED HOUSING WHICH CONTAINS AN INTERNAL POWER SOURCE AND ALL WORKING COMPONENTS, AND ACCEPTS I.V. BAGS OF ALL CAPACITIES. THE DEVICE IS DESIGNED TO BE A SELF-CONTAINED INTRAVENOUS SYSTEM, COMPRISING A RIGID SHELL HOUSING THE I.V. BAG AND A FLUID PROPULSION MEANS. IN USE, THE SHELL CONTAINING ALL COMPONENTS (INCLUDING THE POWER SOURCE) STRAPS ON THE PATIENT'S ARM NEAR THE INFUSION SITE.

ZTEK CORP.  
400-2 TOTTEN POND RD.  
WALTHAM, MA 02154  
MICHAEL HSU

SDIO \$ 83,700

## TITLE:

LIGHT WEIGHT NUCLEAR/ELECTROCHEMICAL SPACE POWER SYSTEM  
T 4 OFFICE:

TO MEET THE POWER REQUIREMENTS OF THE PLANNED SDIO SPACE MISSIONS, POWER SOURCES WHICH ARE COMPACT AND LIGHT-WEIGHT MUST BE DEVELOPED. THE ZIRCONIAL CELL, WHICH HAS BEEN RECOGNIZED FOR ITS POTENTIAL TO OFFER HIGH ENERGY CONVERSION EFFICIENCY, WILL BE ABLE TO ACHIEVE A WEIGHT-TO-POWER RATIO BETTER THAN 1 kg/kw AND VOLUME-TO-POWER RATIOS, 1 m(3)/MW. THE DEVICE IS ADAPTABLE TO NUCLEAR ENERGY SOURCE IN CONJUNCTION WITH AN ELECTROCHEMICAL-LOOP. IT IS AN ENGINEERING CHAL-

FISCAL YEAR 1986

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LENCE TO INTEGRATE THE CELL UNITS INTO A POWER PACKAGE DUE TO THE BRITTLINESS OF THE CERAMIC COMPONENTS AND THE PRESENCE OF THERMAL STRESSES. ZTEK HAS OVERCOME THE PROBLEMS USING SPECIAL FABRICATION AND INNOVATIVE PACKAGING TECHNIQUES. SUCCESSFULLY OPERATED PROTOTYPES HAVE BEEN DEMONSTRATED. THE EXISTING DESIGN FOR COMMERCIAL APPLICATIONS HAS BEEN OPTIMIZED BASED ON COST FACTORS. ZTEK IS PROPOSING AN EFFORT TO DEVELOP A COMPACT AND LIGHT-WEIGHT DESIGN FOR OPTIMIZED SPACE APPLICATIONS. THE ADVANTAGE OF BEING ABLE TO SHARE A COMMERCIAL VIABLE TECHNOLOGY CAN MEAN AN EARLY REALIZATION OF FIELDABLE ELECTROCHEMICAL DEVICES.

bd SYSTEMS INC  
357 VAN NESS WY - STE 110  
TORRANCE, CA 90501  
DR JESSE J BUTTS  
TITLE:  
RV TERMINAL UPDATE  
T 216 OFFICE: BMO/MYSC

AF \$ 74,971

INCREASING THE ACCURACY OF REENTRY VEHICLES AND PROVIDING THE CAPABILITY TO ATTACK IMPRECISELY LOCATED OR RELOCATABLE TARGETS ARE GOALS WHOSE REALIZATION WOULD SUBSTANTIALLY ENHANCE THE SECURITY OF THE UNITED STATES AND REDUCE THE CHANCE OF NUCLEAR WAR. MOST SIGNIFICANT IS THE POTENTIAL FOR INCREASING THE ACCURACY TO THE POINT WHERE NON-NUCLEAR WEAPONS COULD BE EMPLOYED AGAINST STRATEGIC TARGETS. THESE GOALS SHOULD BE ACHIEVABLE THROUGH APPLICATION OF EXISTING OR NEAR-TERM TARGET DESIGNATION AND GUIDANCE TECHNOLOGIES. bd SYSTEMS IS PROPOSING A NEW AND INNOVATIVE TARGET DESIGNATION CONCEPT USING BISTATIC SYNTHETIC APERTURE RADAR TECHNIQUES. THIS NEW CONCEPT HAS THE ADVANTAGES OF BEING OPERABLE IN ALL WEATHER CONDITIONS AND BEING POTENTIALLY IMPLEMENTABLE WITH ONLY MODERATELY SIZED SENSORS AND RECEIVERS ON THE RVS AND ON THE DESIGNATION PLATFORMS. THE OBJECTIVES OF THIS PHASE I STUDY ARE TO ASSESS THE FEASIBILITY OF THIS NEW CONCEPT, TO ASSESS THE FEASIBILITY OF SEVERAL OTHER TARGET DESIGNATION SCHEMES, TO DETERMINE THE TECHNOLOGIES REQUIRED FOR THEIR IMPLEMENTATION, AND TO IDENTIFY THE MOST PROMISING SCHEMES FOR DETAILED ASSESSMENT IN PHASE II.

bd SYSTEMS INC  
357 VAN NESS WY - STE 110  
TORRANCE, CA 90501  
DR J J BUTTS  
TITLE:  
ASSESSMENT OF INTELLIGENCE AND FORCE EMPLOYMENT CYCLE TIME (INFECT)  
T 230 OFFICE: BMO/MYSC

AF \$ 66,163

THE SMALL MOBILE SYSTEM (CSMS) ICBM SURVIVABILITY DEPENDS UPON ITS

FISCAL YEAR 1986

SUBMITTED BY -----	DEPT ----	AWARDED AMOUNT -----
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RELOCATION TIME BEING LESS THAN THE SOVIET INTELLIGENCE AND FORCE EMPLOYMENT TIME (INFECT). THIS STUDY ANALYZES THE MAJOR INFECT COMPONENTS AND PROJECTS THE SOVIET CAPABILITY IN EACH. SURVEILLANCE BY SPACE-BASED SENSORS IS EMPHASIZED. THE TIME FRAME ADDRESSED IS 1992 (THE SMS'S IOC YEAR) THROUGH THE YEAR 2002. THIS PERIOD IS LONG ENOUGH TO ENCOMPASS A SOVIET RESPONSE TO THE SMS.

bd SYSTEMS INC  
357 VAN NESS WY - STE 110  
TORRANCE, CA 90501  
MARGARET A POWER

AF \$ 68,383

## TITLE:

SPECIFICATION OF EXPERT SYSTEMS FOR THE AFSCF

T 67 OFFICE: AFSTC/OLAB

THIS EFFORT WILL PROVIDE A SET OF FOUR GUIDEBOOKS AND A SHORT COURSE FOR MANAGEMENT OF EXPERT SYSTEMS PROCUREMENT, TAILORED TO THE NEEDS OF THE AIR FORCE SATELLITE CONTROL FACILITY (AFSCF), BUT MODIFIABLE FOR OTHER MILITARY SYSTEMS AND COMMERCIAL APPLICATIONS. PHASE I WILL PROVIDE VOLUME I, REQUIREMENTS ANALYSIS FOR EXPERT SYSTEMS, AND THE RELATED PORTION OF THE SHORT COURSE. PHASE I WILL ALSO DEVELOP THE OUTLINE, TECHNICAL APPROACH, AND SUPPORTING RESEARCH FOR THE REMAINING VOLUMES AND SHORT COURSE SEGMENTS (VOLUME II, EXPERT SYSTEM COSTING; VOLUME III, EXPERT SYSTEM TESTING; AND VOLUME IV, TAILORING SOFTWARE SPECIFICATIONS FOR EXPERT SYSTEMS) FOR PHASE II COMPLETION.

TOTAL NUMBER OF AWARDS: 1,018 TOTAL AMOUNT AWARDED: \$54,165,512

## NOTE

There are 14 selections for contract award listed that show zero FY86 dollars. These are being funded with FY87 appropriation.

END

11-87

DTIC